Chemical Abstracts

Published by the

American Chemical Society

Volume 22

NOVEMBER—DECEMBER

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1928

CHEMICAL ABSTRACTS

Vol. 22. NOVEMBER 10, 1928 No. 21

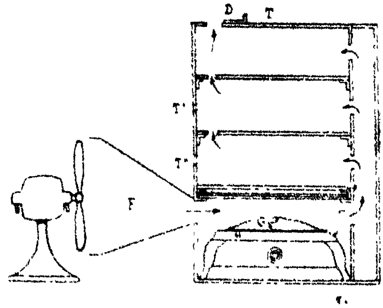
1—APPARATUS AND PLANT EQUIPMENT

W. L. BADGER

Laboratory evaporator. P. OERTEL. *Chem.-Ztg.* **52,** 302(1928).—A steam-heated evapg. bath is described which may be worked at pressures from about 0.2 to 0.5 atm. The mean temp. is 85° and the max. 95°, so that spurting or overheating of the material is avoided. The app. is so designed that little corrosion takes place and that the soln. which is being evapd. cannot be contaminated with products of the corrosion of the bath. B. C. A.

Rapid evaporation at room temperature. E. JANTZEN AND H. SCHMALFUSS. *Chem. Fabr.* **1928,** 373–5, 390–2.—The principles involved in the construction of a high-capacity lab. evaporator (40 l. of water per hr. at 15°) are discussed in detail. To attempt to remove water vapor by simple pump action is very uneconomical. It is better to use a water-jet pump with a condenser. The connection from the pump to the app. must be as short and wide as possible. A multitubular Cu condenser is far more efficient than one of glass. The connection from the evaporator to the condenser should be as wide as possible without any baffling arrangement to prevent splashing, which is guarded against by the low gas velocity and slight pressure drop. The still should be of simple construction of steel, Cu or Al. An app. of 30 l. still capacity constructed on these lines is described. B. C. A.

An effective laboratory drier. R. NEWTON AND W. H. COOK. Univ. of Alberta. *Plant Physiology* **2,** 359–60(1927).—The accompanying diagram is a vertical section of the drier. A galvanized iron box is lined with asbestos sheeting. The shelving and perforated partition shown at the right of the diagram are made of asbestos slate (transite) held in place by light angle-irons and stove-bolts. A rapid air draft is provided by a 9-in. desk fan blowing through the funnel *F*. The path of the air is indicated by the arrows. The air passes across *H*, an elec. hot-plate, into a narrow chamber to the right, from which it enters the drying chamber through 5 circular openings, 1.5 in. in diam., opposite the space above each shelf. The second and third shelves do not run the full width of the drying chamber, but leave an air gap at the left, bridged by light metal pieces (not shown in the figure). A set of air-holes at the top left is fitted with a damper *D* for controlling the draft. The shelf space is 14 in. square, with 4.5 in. between shelves. With the draft full open and the hot-plate turned to "high" (1000 watts), the temp. of the drying chamber was 61–63°. Thermometers are inserted at *T*, *T'* and *T"*, to check the various shelves. To secure the same temp. on all the shelves, it was found necessary to protect the bottom shelf with 2 extra layers of asbestos sheeting, and also to cut down direct radiation by 2 layers of wire gauze *G* over the hot-plate. The narrow chamber to the right is permanently closed in front by the wall of the box. The drying chamber is closed by a glass door, and the hot-plate by a piece of transite contg. an opening for the switch. Over both the latter is fitted an outside door of galvanized iron. The drier has been found satisfactory in speeding up the evapn. of aq. exts. to dryness and for the rapid drying of green plant tissues for analysis. WALTER THOMAS



A small washbottle. C. SHELDON HART. Syracuse Univ. *J. Chem. Education* **5,** 978(1928).—A "Y"-tube passes through a stopper in a small flask, or is connected to the flask by a piece of rubber tubing. Through it a long nozzle-tube passes vertically to the bottom of the flask, being held in place by a small piece of rubber tubing. The

overall height should be kept at a min. and both mouthpiece and nozzle should be as short as possible. W. C. EBAUGH

Drying vessel. A. OPPÉ. *Chem. Fabr.* **1928,** 241.—A vacuum-tight drying vessel capable of being weighed consists of a cap making an external joint on to the vessel, the vessel itself, an upright cylinder, and top and bottom gas connections, the latter forming a spiral on which the vessel rests. The vessel is particularly intended for bulky hygroscopic substances and is adapted for use in a heating bath. B. C. A.

A simplified barometer. H. C. KREMERS. Univ. of Illinois. *J. Chem. Education* **5,** 1004(1928).—A base-board has a wide slot milled out to accommodate a meter stick so that the 2 surfaces are flush, a friction spring holds the meter stick in any position, and the lower end of the stick holds a double pointer, one behind and one in front of the barometer tube. The latter is of the ordinary siphon type, not graduated. The meter stick is set level with the Hg in the lower column (as zero), and a sleeve around the upper part of the barometer tube is made level with the Hg there. The height of the Hg is thus read with ease, and students have little difficulty in understanding the principle involved. A simple set of directions mounted beside the barometer has provided ample guidance to the student using it. W. C. EBAUGH

The history of the Bunsen burner. HEINRICH BILTZ. *Z. angew. Chem.* **41,** 112(1928).—Feldhaus (*C. A.* **22,** 335) states that independently of Bunsen and at about the same time (1851, 1854) R. W. Elsner invented a burner like that of Bunsen. However, a burner in which air was mixed with gas to prevent soot formation was described by Faraday in 1828. Thus the principle of the Bunsen burner goes back to Faraday; to Bunsen belongs the credit for its present form. E. H.

Automatic temperature regulators and their value in laboratory and commercial processes. J. COURNOT. Conservatoire national des arts et métiers. *Chimie et industrie* **Special No.,** 141–7(April, 1928).—A discussion of the advantages of automatic temp. regulation, with a description of the chief types of regulators at present on the market and of the principal methods of using them. A. PAPINEAU-COUTURE

The standardization of thermometers. H. HEINRICH. *Arch. Wärmewirt.* **9,** 193–5(1928).—An account of a study designed to improve certain types of German armored industrial thermometers. ERNEST W. THIELE

A new receiver correction thermometer for the receivers on stills for high percentage spirits. ANON. *Apparatebau* **40,** 195–6(1928).—A correction for percentage is printed on the scale opposite each degree from 5° to 30°. J. H. MOORE

Calorimeter for determination of heats of combustion. A. EUCKEN AND L. MEYER. *Chem. Fabr.* **1928,** 177–9, 195–6.—The app. comprises a heavy hollow Cu cylinder (250 cc.) with Cu lid, carrying the usual ignition app. terminating in a thin Ni wire. The material to be burnt (30–40 mg.) is mixed with 6–8 mg. of kieselguhr and pressed into a small briquet which is placed in a conical silver wire cage in the calorimeter and burnt in O under atm. pressure. The temp. is recorded to the nearest one-thousandth of a degree every 1/2 min. until const. A series of results showing the range of utility of the app. is given. B. C. A.

Gas calorimetry. M. BARASH. *Ind. Chemist* **4,** 336–7(1928).—The Thomas Recording Gas Calorimeter, as designed by the Cambridge Instrument Co., has now reached such a stage of perfection as to be accurate to ± 1 B. t. u. The instrument is now especially well adapted to become the official recording calorimeter to be employed in the administration of the Gas Regulation Act of 1920 which placed the supply of gas to the English public on a calorific basis (the "therm"). E. G. R. ARDAGH

Automatic colorimeter. G. BAGANZ. *Chem. Fabr.* **1928,** 358.—The app. is designed for the control of the chlorination of town's water by the use of benzidine and KI as colorimetric indicators, but is capable of adaptation. It consists of an elec. arrangement for the taking of samples, addn. of indicators and washing out of the app. at regular time intervals, the observation only being left to the attendant.
B. C. A.

New microcolorimeter and its use. H. KLEINMANN. *Chem. Fabr.* **1928,** 263–4, 278–9.—The colorimeter is similar in principle to the Duboscq instrument and consists of a pair of vessels of 1 cc. capacity, dipping rods, lamps, scales and eyepiece. For accurate results careful filtration of the solns. is necessary and air bubbles must not be allowed. Errors then should not exceed 1%. The instrument is suitable in conjunction with a micro-Kjeldahl app. for the detn. of N by Nessler reagent. Quantities as small as 5×10^{-6} mg. can be detd., the principal difficulty being not of manipulation, but in obtaining reagents sufficiently free from NH_3. B. C. A.

Calibration liquids for viscometers. D. KRÜGER. *Z. angew. Chem.* **41,** 375 (1928).—Castor oil and glycerol are not recommended for calibrating capillary viscom-

eters as they are liable to changes, the former under the influence of air and light and the latter on account of its hygroscopic nature. Solns. of sucrose in water, up to 60%, give the best results, and the abs. viscosities, in centipoise units for such solns. at different temps., are tabulated. B. C. A.

Apparatus for the analysis of solutions, especially bleach liquors containing chlorine. K. Hintzmann. *Chem. Fabr.* **1928,** 266-7.—To det. the available Cl in a bleach liquor an app. comprising a graduated tube with a lower reaction bulb and an upper stoppered bulb holding 75 cc. of liquid is used. The reaction bulb is filled with 75 cc. of a standard soln. of indigo-carmine (1.46 g. of the 44/45% powder and 2 cc. of H_2SO_4 per l.), the stopper placed in the upper bulb, the app. inverted and the buret read. The whole is turned back to the normal position and the soln. to be analyzed is added slowly until the color of the mixt. changes from blue to light yellow-green The stopper is replaced, the app. inverted and the buret again read to obtain the amt. of bleach liquor added. B. C. A.

Apparatus for carrying out filtrations, precipitations, etc., in absence of air. P. Dickens. *Chem. Fabr.* **1928,** 323-4.—A conical flask with side tube closed by a glass tap and narrowed at the top is united by a funnel to a similar but inverted flask. Suitable ground-glass joints are provided for the funnel B. C. A.

Manometer for vacuum distillation. F. Friedrichs. *Chem.-Ztg.* **52,** 272(1928).—A manometer which is independent of atm. pressure and can readily be filled with Hg and freed completely from gas and moisture comprises the usual open and closed parallel tubes enclosed in an outer closed protecting tube, and connected to each other through a small valve on the injector principle. To fill the manometer Hg is poured into the open tube, and the closed tube is heated in an inclined position until the air is displaced and the Hg boils gently. The manometer is then filled with Hg until the metal reaches to the cylindrical part of the open tube, when the app. is ready for use. B. C. A.

Extraction apparatus especially suitable for liquids. P. H. Prausnitz. *Chem. Fabr* **1928,** 324-5.—A continuous extractor can be used equally as well as a Soxhlet app. even when of considerable cross-section if the condensed extg. liquid is prevented from falling in one place. This is effected by widening the lower end of the condenser and drawing it out into a large no. of points Extn. is more rapid than with a Soxhlet app. The same device is applied to Wagenaar's app. for extg. a solute from a lighter liquid with a heavier one. A glass filter is of no use as a distributor in these 2 cases, but is serviceable in the extn. of a heavier liquid with a lighter one. B. C. A.

Extraction apparatus especially for use with liquids. P. H. Prausnitz. *Chem. Fabr.* **1928,** 346-7.—The use of a perforated glass filter, in the extn. of aq. solns. with ether, in the bottom of the extn. tube is of great value in producing effective distribution. The extn. tube should be cylindrical and the space beneath the filter plate as small as possible. Several different arrangements of extn app. are described and times required for complete extn. of a given soln detd. B. C. A.

Apparatus for the determination of carbon by the baryta method. P. Dickens. *Chem. Fabr.* **1928,** 293-4.—The $Ba(OH)_2$ is contained in an absorption tube with a glass filter plate at the bottom above the gas inlet The restriction on the passage of the gas causes the combustion tube to be under pressure during operation, while the app. is previously swept out with pure O. Above the tube is a filter and flask so arranged that after combustion the app. may be inverted and the $BaCO_3$ filtered and washed with water free from CO_2. The excess of $Ba(OH)_2$ is titrated and the pptd $BaCO_3$ weighed as $BaSO_4$ The method gives results accurate to $\pm 0.001\%$. B. C. A.

Precision gas buret for volumetric determination of carbon. Oskar Meyer. *Chem. Fabr.* **1928,** 520-1.—The app. is designed for the *detn. of C in Fe and steel* and is so constructed that the vol. of CO_2 is cor. for temp. and pressure and the % C read directly from a scale accurate to 0.002%. J. H. Moore

Method of determination of melting point with electrical signal. G. Wick and G. Barchfeld. *Chem. Fabr.* **1928,** 281.—The substance is packed in the bottom of a glass tube and above it rests a narrow glass rod on which rests a contact arm. The tube is placed in a heated block and when liquefaction occurs the rod and arm fall, closing an elec. circuit. B. C. A.

Apparatus for the determination of the molecular weight by the boiling-point method. H. Rupe and Natala Wassilieff. Anstalt für organ. Chemie, Basel. *Helv. Chim. Acta* **11,** 713-6(1928).—A modification of the app. of Washburn and Read (*C. A.* **13,** 1172) is described. The new device is simpler and less expensive. It has been used with Me_2CO, C_6H_6, $CHCl_3$ and H_2O as solvents; the mol. weights were obtained within about 5%. A. L. Henne

Apparatus for sampling powdered solids. J. von Meerscheidt-Hüllessem.

Chem. Fabr. 1928, 357–8.—A four-sided pyramid of sheet iron standing upright is provided with wings on each angle so as to direct material sliding down each face into a sep. container. A funnel-shaped container above the pyramid is held centrally above its axis by a wooden staff which also closes the bottom of the funnel, and the whole is encased in a cylinder. The funnel is filled with the sample to be reduced, and the wooden plug lifted when the sample is automatically "quartered." B. C. A.

Centrifugal mixers. E. Buhtz. *Chem. Fabr.* **1928**, 211–3.—Several types of mixers are described, the essential feature being that the 2 liquids, or the liquid and solid, to be mixed are fed continuously on to a rapidly rotating dish, over the edge of which the finished mixt. passes. Provision is made for heating the dish and inlet pipe, for removal of gases evolved, etc., as necessary. Their use is suggested for the *acid treatment of crude oils*, the *salting out of soaps* and the *refining of fats*. In some cases spiral baffles are provided. Another type of app. has an upper rotating plate and a lower funnel-shaped dish with common axes revolving in opposite directions. This is intended for the mixing of colors, moistening of powders, etc. B. C. A.

A mechanical agitator. G. N. Quam. Coe College, Cedar Rapids, Ia. *Ind. Eng. Chem.* **20,** 908(1928).—An agitator (20 × 35 × 14 cm.) is illustrated. It has 6 test tubes (2.5 × 20 cm.) placed along opposite sides, each tube with a stopper and breather outlet. The agitator floats in a H_2O thermostat and can be rocked through 30–35°, thus causing the test liquid to flow over the metal strips (7.5 × 4 cm.) folded up and inserted in the tubes. Thus for raw whole sweet milk metals showed the following approx. losses when heated to 75° for 30 min.: Cu 1.38–1.72, Zn 0.68–1.03, Ni 6.02–6.71 and Sn 0.0–0.17 mg./sq. dm. W. C. Ebaugh

An apparatus for the measurement of radiation intensity over a wide range of wave lengths (0.02-3 A. U.). Otto Glasser and V. B. Seitz. *J. Optical Soc. Am.* **17,** 240–7(1928). E. H.

Spectrocomparator. F. Stanley. *J. Optical Soc. Am.* **16,** 208–10(1928).—A comparator, which enables 2 spectra taken on different scales to be compared directly, is described. The optical system is arranged to give different magnifications in the 2 fields, and the eyepiece carries a micrometer. B. C. A.

A microphotometer for comparative measurements of density on x-radiogram spots. K. V. Vasil'ev. *Trans. Inst. Econ. Mineral. Met.* (*Moscow*) No. **34,** 16–19 (1928).—A microphotometer, consisting of 2 identical microscopes, (made with an eyepiece, a Lummer's cube and 2 adjustable object-glasses), a source of light and a means for mounting the x-ray photograph to be examd. and a photographic wedge, is described. The microscopes are focussed on the wedge and film, resp., and then adjustment of the wedge is made until images of the wedge and spot are indistinguishable. The central portion of the image at the eyepiece is the image of the examd. spot and its extent depends upon silvered area in the Lummer's cube. The outer portion is the image of the photographic wedge. R. L. Hershey

A simple camera for obtaining oriented Lauegrams. K. V. Vasil'ev. *Trans. Inst. Econ. Mineral. Met.* (*Moscow*) No. **34,** 26–35 (1928).—A simple Laue camera consists of a lead-covered box, provided with a lead slit system, and a set of spring clips for holding the plate. The specimen, in the form of a crystal plate of known orientation, is held by a spring clip against the flat end of the slit system. R. L. Hershey

A new electrophoresis cell. Melvin Mooney. *Phys. Rev.* **29,** 218(1927).—A new cell consisting of a complete hydrodynamic circuit is described. The lower half of the loop is a long 0.7 mm. capillary tube, with thin walls to permit microscopic observation of the colloidal particles within. The upper half, filled with distd. H_2O, is a short 12-mm. tube and has, therefore, a small hydrodynamic resistance. Hence the H_2O moves through the capillary with uniform velocity over its cross-section, the compensating reverse flow occurring in the large tube. The advantages are: the correction applied to the observed velocity of a colloidal particle to obtain its velocity relative to the H_2O is no longer subject to errors in locating the particle in the tube; the endosmotic velocity of the H_2O is generally opposite and approx. equal to the electrophoretic velocity. Hence the arrangement is suitable for precise measurement of 2 differences in mobility of different particles or of the same particle under different fields. R. L. Hershey

Applications of a new ebullioscope. Wojciech Swientoslawski. *Roczniki Chem.* **7,** 516–33(1927); cf. *C. A.* **13,** 1172; **18,** 777, 2444; **19,** 2427; **21,** 1398, 2821, 3532; **22,** 514; W. Daniewski. *Dissertation,* Polytechnic School, Warsaw.—Several gradually improved modifications of Washburn and Read's ebullioscope are described. A final "*differential*" model consists of a flask of 200 cc. (*A*), with a side tube for filling and 130 × 5 mm. neck through which the liquid is carried into a tube *H*, 130 ×

30 mm. There it flows down a fused-in 60 × 18 test tube filled with Hg into which a Beckmann thermometer dips. It measures the temp. of the soln. The solvent vapors rise through a 12 mm. wide side-tube to a tube *B* which differs from *H* only in that it carries a reflux condenser. It measures the b. p. of the solvent. The test tubes are surrounded by glass coils to facilitate the down-flow of the condensate. *H*, *B* and condenser siphon back to *A*. All connections are fused on. The accuracy of measurements is ±0.0015° to 0.002°. When connected with a manometer and kept at a const. temp. the app. (a simpler one-tube model) gives changes in *pressure* with an accuracy of 0.03 mm. This *ebullioscopic barometer* (*I*) is used for the detn. of *atm. pressure*. It served for the detn. of the deviation of *cane sugar solns.* from Raoult's law. The *standardization* of a *thermometer* gave 1.038° per 1° instead of the 1.039° given by the Physikalisch-technische Reichsanstalt. For the detn. of the b. p. of pure liquids and mixts. the b. p. was detd. in one ebullioscope, while in another water was kept with the aid of a pump under such a pressure as to make its b. p. identical with the liquid under 1 atm. It was thus demonstrated that *benzene* did not have 2 fractions with identical b. p. The b. ps. found were: 80.161, 80.171, 80.175 and 80.185°. *I* also permits the direct detn. of dp/dt from simultaneous readings of t and p and the calcn. of the *heat of evaporation* from these values. It was detd. for a no. of esterification mixts. by S. and E. Józefowicz. (*Dissertation*, Polytechnic School of Warsaw). The *equil. const.* of *acetylation of EtOH* was detd. by placing in 1 ebullioscope AcOEt + water and in another AcOH + EtOH and connecting both with *I*. From the b. p. of the mixts. near equil. *K* was calcd. to be 3.68 in accordance with E. Dobbin (Dissertation, Brynn Mawr, 1920). The *K* for the vapor phase was found with a slight modification to be 58, while Edgar and Schuyler found 608. S.'s relative error of measurement was 2.5 times smaller than that of E. and S. *I* also permits the detn. of the *reaction velocity* of such reactions in which a change of mol. nos. occurs and in which none of the reacting substance has a sufficient vapor tension to affect the total pressure; t is kept const. and p is registered at intervals. Z. Blaszkowska and M. Glowacka (Glowacka, *Dissertation*, Polytechnic School, Warsaw, 1926) have detd. $K\ 10^{-6}$ for the decompn. of *bromosuccinic acid* to be 484 in fairly good agreement with Zawidzki and Wyczakowska's detn. by the usual kinetic method. The app. will prove useful in detns. of *b. p. under high pressure*, of the *temp. coeff. of soly.* and exact b. p. of mixts. with a max. and min. b p. For *EtOH + water*, *e. g.*, identical readings on both thermometers will be obtained only for pure EtOH and the mixt. with the min. b. p. MARY JACOBSEN

A goniometer for measuring crystals in ordinary and x-ray light. K. V. VASIL'EV. *Trans. Inst. Econ. Mineral. Met.* (*Moscow*) No. **34**, 20–5(1928).—The instrument has a telescope and collimator for measurements with ordinary light, and a plate holder and slit system for x-ray work. A vertical and a horizontal circle enable orientation of the specimen to be made. R. L. HERSHEY

Registering photodensitometer. E. A. HARRINGTON. *J. Optical Soc. Am.* **16**, 211–22(1928).—A direct-reading, self-recording densitometer with single thermocouple and low-resistance D'Arsonval galvanometer, which can be used for measuring the relative opacities of photographic images of line spectra and powder photographs, is described. Quick action and small lag result from the small heat capacity of the thermocouple and special arrangement of the galvanometer. Applications to x-ray work and ordinary spectroscopy are discussed. B. C. A.

Apparatus for the determination of gas densities. M. NIKIEL. *Metan* **9**, 203–10 (1925).—The d. of a gas is compared with that of air by a detn. of the time taken for a liquid to flow out of a vessel attached to a gas supply, and then opened to the air. The app. is described and figured. B. C. A.

Thermosiphon heaters for high temperatures. HCH. ROSER. *Arch. Wärmewirt.* **9**, 285–90(1928).—The theory of the type of heater in which a liquid under pressure is used to convey heat by natural circulation is discussed. If water is used as the fluid, the limiting temp. is about 200–250°; above this point the space left in the expansion chamber is so small that a slight overheating may lead to bursting. This may be overcome by filling the expansion chamber with gas under pressure. Aniline or Hg might be used instead of water, but the cost would be greater and the lines would be larger; except for high temps. they would not be economical. Installations of this type of heater for drying and baking enamel are described and illustrated. E. W. T.

An improved Orsat apparatus for the analysis of flue gases. KARL MÜNZER. *Chem. Fabr.* **1928**, 518–20.—The "Mono" app., very similar to the Hays portable app., is described. J. H. MOORE

A small flue gas tester. A. GROSZ. *Feuerungstech.* **16**, 163–4(1928).—The CO_2 app. described contains no liquid and one cock. After the sample has flowed

through the app., a turn of the cock puts it in contact with lime. After turning over several times to mix the lime and gas, the reduction in pressure is read off on a diaphragm by making an elec. contact through a micrometer screw. The app. is 9 × 9 × 5 cm.
ERNEST W. THIELE

Pump for handling molten salts. HEINRICH OETTINGER. *Chem. Fabr.* **1928,** 516–8.—A centrifugal pump similar to pumps that have long been used in America for filling drums with fused NaOH. J. H. MOORE

Dependable heat transfer, especially in autoclaves. ALBERT SANDER. Instituto Ronzoni, Mailand. *Chem. Fabr.* **1928,** 515–6.—Heating of 2 2000-l. autoclaves under 40–50 atm. pressure and 1 larger autoclave under 12–14 atms. to 200° was satisfactorily accomplished by a combination of H_2O and oil heating. H_2O at about 200 atm. pressure was circulated through a heat exchanger where mineral oil of 270° flash was heated to 220–5°, giving the autoclaves an internal temp. of 190–200°, and requiring 20–30 kg. of coke per hr. to heat the H_2O. J. H. MOORE

An automatic time switch for prolonged heating, etc. ALEX. GUTHRIE. *J. Soc. Chem. Ind.* **47,** 202T(1928).—A household gas tap is well oiled to work freely and is screwed on to a piece of brass tubing 25 × 1.3 cm. Holes 1.7 cm. apart are drilled in the gas tap and in the winder of an alarm clock. The tap and winder are bolted face to face, their axial plane perpendicular to the place of the winder and tap. The alarm is wound up not more than 1 or 2 turns more than is required just to turn off the gas. The tube is clamped horizontally and rubber tubing is attached to each end. The alarm is set and the gas tap turned on. When the time expires the winder will rotate and turn off the gas. The device has also been used to switch off elec. current.
S. L. B. ETHERTON

Selenium cell. R. E. MARTIN. *J. Optical Soc. Am.* **16,** 279–81(1928).—A cell in which the Se is in the form of a cylinder, and a method for making the latter by pouring viscous Se are described. B. C. A.

Ultra-pressures of 25,000 kg. per square centimeter and their scientific applications. JAMES BASSET. *Chimie et industrie* **Special No.,** 148–51(April, 1928); cf. *C. A.* **21,** 3492; **22,** 516.—A description of the app. devised by B. for carrying out phys. or chem. expts. at pressures of 25,000–30,000 kg. per sq. cm., with an outline of some of its possible scientific applications. A. PAPINEAU-COUTURE

The best material for water pipes in buildings. A. BÖRNER. *Apparatebau* **40,** 196–8(1928).—In the long run Cu is cheaper and less troublesome than Fe. J. H. M.

Standard Catalogue of Scientific Apparatus, 1928. Vol. I. Chemistry. London: Baird & Tatlock (London), Ltd. 1141 pp.

Rotary sectional drum filter. DORR CO. Brit. 284,101, March 7, 1927. Structural features.

Rotary suction filter of the sector type. J. B. VERNAY. Brit. 283,876, Jan. 18, 1927.

•**Filter for water, petroleum or other liquids.** CHARLES G. HAWLEY (to Centrifix Corp.). U. S. 1,684,025, Sept. 11. Structural features.

Device for separating impurities from steam. CHARLES G. HAWLEY (to Centrifix Corp.). U. S. 1,684,024, Sept. 11.

•**Apparatus for separating or classifying coal or other materials.** WILLIAM A. RIDDELL (to Frederick Iron & Steel Co.). U. S. 1,683,918, Sept. 11.

Electron tube. FA. JOH. KREMENEZKY and KARL SCHOENBAUER. Austrian 108,526 Dec. 15, 1926. The tube includes a grid between the anode and the cathode, and a reflector on the other side of the anode.

Ebullioscope. LUDWIG FARBER. Austrian 108,558. Aug. 15, 1927. In an ebullioscope for alc. liquids, the tube connecting the heater with the condenser is bent, so that the upward flow of vapor is not impeded by the downward flow of the condensed liquid.

Combined pressure gage and thermometer for use on boilers, etc. ORVILLE W. THOMPSON (to Jas. P. Marsh & Co.). U. S. 1,683,743, Sept. 11. Structural features.

Hydrometer and enclosing chamber for testing automobile radiator liquids, etc. GEORGE A. SMITH. U. S. 1,683,735, Sept. 11. Structural features.

Refractometer. H. VOELLMY. Brit. 283,859, Jan. 17, 1927. Structural features.

Heat exchanger for gases. MASCHINENFABRIK ING. HANS SIMMON. Austrian 108,740 Sept. 15, 1927. A heat exchanger for gases is constructed as a centrifugal fan and comprises a chamber traversed by a rotary shaft on which a disk is mounted

so as to divide the chamber into two parts. Metal plates, water-filled tubes, etc., are attached to the disk.

Apparatus for cooling jets of air, anesthetic gases, etc. S. BRAUNSTEIN and S. MEERSON. Brit. 283,583, Jan. 15, 1927. Vapor from liquid air may be used as a cooling medium.

Apparatus for separating impurities from air, gas, steam, etc. CHARLES G. HAWLEY (to Centrifix Corp.). U. S. 1,684,022, Sept. 11. Structural features.

Separator and jet compressor for air and similar mixtures. WALTER MILATZ. Ger. 464,008, July 26, 1928.

Apparatus (with inclined rotary tubes heated by furnace gases) for evaporating liquids. CHEMISCHE WERKE VORM. H & E. ALBERT. Brit. 283,495, Jan. 11, 1927.

Distributing liquid currents in suspension vats. AKTIESELSKAPET KRYSTAL. Norw. 44,094, June 7, 1927. Mech. features.

Apparatus for spray desiccation of liquids. J. A. REAVELL. Brit. 284,049, Nov. 15, 1926

Device for lifting and delivering liquids in measured quantities. FRANZ GOUVION. Austrian 108,491 Aug 15, 1927. In a device of the kind in which liquid is pumped into one of two measuring vessels, the air from which passes into the other measuring vessel and displaces the liquid therefrom, the overflow pipes of the vessels are arranged to return liquid to the suction side of the pump and to serve also as the passage for the air

Apparatus and procedure for irradiating liquids by ultra-violet rays. H. SCHOLL. Brit 283,472, Jan. 7, 1927. Air may be removed from the liquid treated, *e. g.*, by use of CO_2.

Apparatus for testing the weathering properties of steel plates or other materials by exposure to water sprays and ultra violet rays, etc. C. W. JAMESON. Brit. 283,539, Feb 13, 1927.

Acetylene generator. KARL BRUNBAUER and EDMUND PRUSENOVSKY. Austrian [illegible], Sept. 15, 1927. An acetylene generator for inflating a life belt is described.

Apparatus for catalytic reactions. PETROLE SYNTHETIQUE SOC. ANON. Brit. [illegible], Jan 18, 1927. Gases or the like are subjected to heat and contact with a catalyst in a narrow space which may be of annular form "of the order of a few mm. in thickness" and are subsequently cooled in a similar app. Various structural details are [illegible].

Apparatus for catalytic reactions. A. O. JAEGER (to Selden Co.). Brit. 283,887, [illegible] 19, 1927. At least one converter of a catalytic converter system is provided with cooling means sufficient to enable it to operate at rates in excess of normal conv. output, followed by at least one converter of much less effective cooling capacity, with or without coolers or heat exchangers between the 2 stages. Numerous details of construction are described and the app. is suitable for various reactions including reduction, dehydrogenation, hydrogenation, halogenation, oxidation and condensation, as in the production of SO_3, MeOH, oxides of N or NH_3 or the treatment of water gas. Also U. S. 1,685,672, Sept. 25.

Furnace. NAAMLOOZE VENNOOTSCHAP STIKSTOFBINDINGSINDUSTRIE "NEDERLAND." Ger. 463,718 July 19, 1928. Furnace for high-temp. normal pressure reactions with walls with outer layers of refractory materials, an inner layer of metal and an intermediate layer of liquid or gaseous material.

Muffle furnace for annealing. BRITISH FURNACES, LTD. AND E. W. SMITH (Surface Combustion Co.). Brit. 283,767, March 22, 1927.

Use of natural olivine rock for furnaces or other apparatus exposed to high temperatures or to chemical action. V. M. GOLDSCHMIDT and R. KNUDSEN. Brit. 283,791, June 22, 1927. Solid pieces may be used or smaller pieces may be agglomerated with a binder such as colloidal Mg silicate, MgO, $Mg(OH)_2$, talc, lime, clay or bituminous material.

Tunnel kiln suitable for calcining, firing, etc. HARRY M. ROBERTSON. U. S. 1,683,807, Sept. 11. Structural features.

Rotary kiln for manufacture of cement by the wet method, distilling carbonaceous materials, drying coal, limestone, clay, etc. E. ALLEN & CO., LTD. AND W. J. COLES. Brit. 283,669, Oct. 29, 1926. Structural features.

Heat-control device for ovens. ALVIN G. SHERMAN, GEORGE H. RAMIG, GEORGE SMITH and CYRIEL A. ROOSE. U. S. 1,684,205, Sept. 11.

Apparatus (with superposed sections containing rotary trays) for drying cereals, ammonium sulfate crystals, etc., or for carbonizing coal. R. V. FARNHAM. Brit.

283,717, Dec. 18, 1926. Heating gases may be passed into the uppermost section and exhausted from the lowermost.

Acid-proof linings for vessels in which materials are heated. I. G. FARBENIND. A.-G. Brit. 283,964, Jan. 22, 1927. Slabs of cast Si are used for making linings.

Steam feed regulator for apparatus for production of hydrogen from steam and iron. COMPAGNIE DE PRODUITS CHIMIQUES ET ÉLECTROMÉTALLURGIQUES ALAIS, FORGES ET CAMARGUE. Ger. 463,947, July 19, 1928.

Valve for carbon dioxide cylinders. LUX BRANDSLUKNING A. S. Norw. 44,913, Feb. 27, 1928.

Apparatus and system for testing materials under vibratory stresses. LOSENHAUSENWERK DÜSSELDORFER MASCHINENBAU A.-G. Brit. 283,787, June 13, 1927.

Thermionic active cathode material. STANDARD ELECTRIC A. S. Norw. 44,658, Nov. 28, 1927. Equimol. quantities of Ba or Sr carbonate and metallic Ni are heated to about 1200° in the presence of air or O_2 by which are formed nickelites of Ba or Sr. The product is crushed and pulverized and mixed with Pt powder in amts. varying from 50 to 99%. The mixt. is molded by pressure to a rod of the desired dimensions which is placed in a vacuum furnace and heated to about 1600° by which the nickelites are decomposed and the earth alk. oxides are obtained in uniform and very fine distribution in the Pt-Ni rod which can now be worked to wire.

Thermostat formed of connected metal plates of different coefficients of expansion. PERRY S. MARTIN. U. S. 1,683,908, Sept. 11.

Thermostatic device (with a tilting mercury switch) for furnace chambers, etc. N. H. FREEMAN. Brit. 284,008, Oct. 19, 1926. Structural features.

2—GENERAL AND PHYSICAL CHEMISTRY

GEORGE L. CLARK AND J. H. REEDY

Aime Argand and his discovery. W. LEYBOLD. Hamburg. *Gas Wasserfach* **71**, 745–50(1928).—An illustrated historical review of the development of the Argand oil and gas lamps. R. W. RYAN

Theodor Curtius. HEINRICH WIELAND. *Z. angew. Chem.* **41**, 193–4(1928).—Obituary. E. H.

Johannes Gadamer. WERNER SCHULEMANN. *Z. angew. Chem.* **41**, 487–8(1928).—Obituary. E. H.

Paul Jeanmaire (1851–1928). AUGUSTE ROMANN. *Bull. soc. ind. Mulhouse* **94**, 381–4(1928).—An obituary with a list of his chief works from 1872 to 1914 A. PAPINEAU-COUTURE

Memorial address on Justus von Liebig. F. HABER. *Z. angew. Chem.* **41**, 891–7 (1928). E. H.

Charles Frederick Mabery, a pioneer. W. R. VEAZEY. Case School of Applied Science. *J. Chem. Education* **5**, 1117–20(1928). E. H.

Alessandro Volta. TEÓFILO ISNARDI. *Anales asoc. quim. Argentina* **25**, 391–417(1927).—An address. E M. SYMMES

Alfred Werner. PAUL PFEIFFER. Univ. of Bonn. *J. Chem. Education* **5**, 1090–8 (1928).—Biography. E. H.

Theodor Zincke. K. KROLLPFEIFFER. *Z. angew. Chem.* **41**, 367–8(1928).—Obituary. E. H.

Chemistry and the American Chemical Society. S. W. PARR. *Ind. Eng. Chem.* **20**, 994–7(1928) *Science* **68**, 307. E. H.

Chemical Education at the University of Vienna. JOHN S. REESE, IV. *J. Chem. Education* **5**, 1124–8(1928). E. H.

Chemistry projects in high school. J. E. MAHANNAH. Augusta High School. *J. Chem. Education* **5**, 1112–6(1928). E. H.

The value of the lecture-table demonstration in the teaching of chemistry. L. A. WILES. *J. Chem. Education* **5**, 1109–11(1928). E. H.

An experiment in coöperative teaching. WM. LLOYD EVANS AND JESSE E. DAY. Ohio State Univ. *J. Chem. Education* **5**, 1133–5(1928). E. H.

Ancient and modern mummification. HERMANN STADLINGER. *Pharm. Zentralhalle* **69**, 483–5(1928).—Beginning with the earliest known procedures of the Egyptians down to the most recent patented and other reported processes, the author describes the various more or less successful methods for perpetuating animal remains in both form and substance. W. O. E.

Nomography. II. O. LIESCHE. *Chem. Fabr.* **1928**, 228–30, 241–3; cf. *C. A.* **22**, 3858.—The construction of charts for the reading of analytical results of the type corresponding with the relation $y = f(x)$ is developed. In the detn. of $BaSO_4$ by sedimentation the original curve is parabolic. If the relation is linear as in the iodometric detn. of Sb, sulfites, etc., the chart takes the form of 2 scales at an angle. A more complicated linear relationship is found in the conversion of wt.-% into at.-% in alloys, *e. g.*, of Mg-Cu. The direct construction method cannot be used directly for non-linear relationships, but by breaking up the equation it may be partly applied. The method may be equally applied to empirical data as in the distn. of a mixt. of water and C_6H_6. B. C. A.

Nomography. III. Logarithmic and exponential functions. O. LIESCHE. *Chem. Fabr.* **1928**, 359–61, 392–4; cf. preceding abstract.—The use of logarithmic scales facilitates the graphical soln. of numerous problems. Various examples are given of the combination of a logarithmic scale and an equally divided scale or of two logarithmic scales arranged either parallel or "projectively" at an angle for the graphical detn. of the breaking down of meso-Th, the variation of a reaction velocity with the temp., the iodometric detn of Sb, etc. B. C. A.

Physical methods in chemical laboratories. I. Introduction. F. PANETH. *Z. angew. Chem.* **41**, 507–8(1928).—An introductory discussion. **II. Vacuum technic.** K. PETERS. *Ibid* 509–15.—Modern methods of evacuation, measurement of pressure and investigation of in-leaking are reviewed and the scope of the application of vacuum methods to analytical, photochemical, preparative and other problems is briefly outlined. A number of diagrams and references are given. **III. Production of intense magnetic and electric fields.** H. GEHLEN. *Ibid* 714–6.—Modern methods for the production of intense magnetic and elec. fields are briefly described. **IV. Significance of spectroscopy in chemical investigations. I.** E. RABINOWITSCH. *Ibid* 555–61.—Energy-levels and term-systems are briefly explained, and the methods whereby heats of ionization and dissocn. are deduced from spectroscopic evidence are indicated. B. C. A.

The rare elements. FREEMAN P. STROUP. *Am. J. Pharm.* **100**, 499–509(1928).—A popular lecture. W. G. GAESSLER

Available energy. ROBERT A. MILLIKAN. Norman Bridge Lab. of Physics. *Ind. Eng. Chem.* **20**, 1117–21(1928) *Science* **68**, 279–84. E. H.

Molecular weights of saturated vapors by the effusion method. HENRY EYRING. Univ. of Wis. *J. Am. Chem. Soc.* **50**, 2398–2401(1928).—The success of the effusion method for the detn. of mol. wts depends upon accurate time and pressure measurements, and upon the selection of a size of orifice which reduces viscosity effects to a min. Under these favorable circumstances, an accuracy of 1% is attainable. An all-glass app. is described. Mol. wt. detns. of the vapors of Me, Et and Pr alcs., C_6H_6, CCl_4 H_2O and $CHCl_3$ gave the values: 32–32.8, 46.5–45.4, 56.2–60, 77.6–77.3, 152, 184 18.54 and 116.5, resp. The data for satd. H_2O vapor and the org. vapors at room temp. indicate that there is no assocn. in the vapor phase. J. H. PERRY

Molecular and atomic volumes. XVII. The space and magnetochemistry of the solid cyanides. WILHELM BILTZ, W. ESCHWEILER AND A. BODENSIEK. *Z. anorg. allgem. Chem.* **170**, 161–83(1928); cf. *C. A.* **22**, 360.—The ds. of numerous complex solid cyanides were detd. The methods of prepn. of these cyanides are given. The solubilities for series of the salts is also given. Some salts not previously described are reported, as $ZnNi(CN)_4$, which was pptd. from a $K_2Ni(CN)_4$ soln. by $ZnSO_4$. A greenish yellow amorphous $NiAu_2(CN)_4$ was prepd. by treating a $KAu(CN)_2$ soln. with $Ni(NO_3)_2$. This gave a white, finely cryst. ppt., which contained too little Au. This gave after 1/2 hr's. digestion on the water bath with 0.5% H_2SO_4 and 4 days' drying *in vacuo* at 150° a pure yellow anhydride, which gave upon hydration a white hydrate. $NiW(CN)_8$, a yellow-green ppt., gave after 3 days' drying at 150° *in vacuo* a grayish brown amorphous ppt. For analysis, the cyanides were decomposed with concd. H_2SO_4 or pyrosulfate, and in rare cases, with aqua regia. The d. measurements are accurate to 0.01%, but on account of the various sources of error introduced by the amorphous nature of the prepn., pseudo-vols. due to hydration, occlusion, etc., the accuracy of the results may be lessened to a certain extent. The observed values are in good agreement (< 1%), on the whole, with those values detd. from x-ray d. measurements. There are no direct measurements upon the solid cyanides for the detn. of the vol. relations. However, it is possible to det. the null point of 20–24 cc. by a study of isosters of org. substances, and $Ca(CN)_2$. Most of the simple cyanides give values of 20–24 cc. for the CN vol. The bivalent metals show a greater spacing, 20–30 cc., except that $Ni(CN)_2$ has a vol. of 20 cc. For the double K cyanides, the contraction is greater,

the higher the coördination number. The same is observed for the Werner ammonium complexes and for the luteo-complexes, but not for the weaker ammonium complexes. The relation between the stability and the spatial requirements of the cyanides cannot be ascertained. The position of the central atom in the periodic system is also essential. The dilatation, in each group, increases with the at. wt., as is also the case with the solv. of the salts. If H is introduced instead of K, no fundamental changes are observed. For the heavy-metal cyanides, the same values are, in part, obtained as for the K salts, and the others are more widely spaced. The polymerization of the heavy-metal double cyanides is discussed. According to the theory of Abegg and Bodländer the stability of the complex is dependent upon the electro-affinity of the central atoms, that is, the more noble metal forms the central atom of the complex, and the more common element the individual ion. If both metals are equally noble, the ordinary schematic formulas, as $Ni_2[Fe(CN)_6]$ and $FeNi[Ni(CN)_6]$ are suggested. In order better to understand the behavior of the above complexes, the Ni may be pptd. out by means of dimethylglyoxime. It is of interest to note that in most of these cases, the normal CN value appears, which makes an explanation even more difficult. The CN vols. for a series of hydrates and cyano salts whose ds. are listed in the literature are given, as well as the good agreement of those values with those of the cyano-cobalt ammines which had been measured by Hassel and Salvessen by x-ray methods. Fulminic acid (O_2 value 1.6–3.9 cc.) and thiocyanates ($S < 15$ cc.) are briefly mentioned. According to Sidgwick's rule, those complexes are favored which have an effective at. number similar to the atomic no. of the next following rare gas. Central atoms, in these cases, which were formerly paramagnetic according to Welo and Baudisch are diamagnetic. The above behavior is fulfilled by the cyanides. The variation of the effective at. no. of those groups showing similarity to the rare gases corresponds closely to the Bohr magneton no. Further, it is also shown, by Sidgwick, that those complexes are the most stable in which the coördination no. attains the expected value, that is, which gives the rare-gas configuration. Isomeric diammino cobalt chloride shows a similar magnetic behavior. Luteo cobalt oxalate is diamagnetic although it varies in space chemistry from the luteo chloride. It is suggested also that the hexammine of Fe is not remarkably stable, and is also paramagnetic, whereas it should have about the same behavior as the luteo salts. In the dipyridyl complex, a diamagnetic Fe salt is known. Entirely in disagreement with Sidgwick's rule is the diamagnetism of $K_2[Ni(CN)_6]$, which W. Klemm detd. both on the hydrate and anhydride on prepns. of C. Fendius. L. L. Q.

Molecular and atomic volume. XX. Space requirements of hydrogen in metallic hydrides. WILHELM BILTZ. Tech. Hochschule, Hanover. *Z. anorg. allgem. Chem.* **174**, 42–6(1928); cf. *C. A.* **22**, 3324; and Proskurnin and Kazarnovskii, *C. A.* **22**, 3851.—In alk., alk. earth and rare earth hydrides the relation of calcd. to observed mol is 2.02 ± 0.03. In hydride formation from these elements there is therefore a contraction from zero-point, vol. to about $^1/_2$, and the H vol. in the hydrides is on the av. 5.7. With V, Cr and Pd, however, the contraction of the elements with hydride formation is much less, the ratio of the calcd. to the observed values being 1.59 for V hydride, 1.33 for Cr hydride and 1.55 for Pd hydride. These are really not compds. but solns. of H in the metal. With Zr and Ti, however, the hydrides behave like the alkali hydrides in respect to vol. contraction, the ratio of calcd. to observed mol. vol. being 2.2 and 2.3. H. STOERTZ

Determination of the coefficients in chemical reactions by positive and negative valences. IGNACIO PUIG. *Atti congresso naz. chim. pura applicata* **3**, 1259–82 (1927).—Rules for the sign of the valences. H functions always +1 when united to metalloids and −1 when united to metals. The first case is more frequent, the second occurring only in the hydrides. Metalloids show greater variety in sign of valence. When metalloids are united with H or with metals they are negative and when united to other metalloids the more negative unites by its negative valences. Thus O, next to F the most neg. element, unites with all other metalloids by its neg. valence. Metalloids forming part of acids possess the same valency as in the corresponding hydrides. Metals almost always function positive to metalloids in metal/metal unions, the more electronegative functions with neg. valence. [illegible] the number of valences are: when an atom of an element forming part of a mol. is linked to similar atoms [illegible] one or more valences these valences are negligible; for metalloids, the fundamental valence in oxidized compds. is the same as in anhydrides; in acids the metalloid has the same valence as in the corresponding anhydride; in salts the metalloids have the same valence as in the acids or anhydrides which yield these salts. Metals always have the ordinary valency usually assigned. Examples are given of practical process

for detg. the valence and of the resolutions of reactions capable of multiple solns. Examples are given of the fundamental rule for the calcns. of the coeffs. *viz.*, that in every reaction the no. of oxidized valences equals the no. reduced. There is a bibliography of 16 references, of which over half are in Spanish. S. L. B. ETHERTON

The modifications of carbon. W. A. ROTH. *Z. angew. Chem.* **41,** 273–8(1928).—A review. E. H.

Evidence of the anisotropy of the carbon atom. KATHLEEN LONSDALE. *Phil. Mag.* [7], **6,** 433–45(1928).—The possible symmetry of the C atom is investigated in the light of x-ray results on crystals of C_2Cl_6 and isomorphous compds. A model is obtained having two A and two B valencies, geometrically different and a comparison is made with the Main Smith-Stoner atom. Work in other fields is also quoted in favor of a non-tetrahedral C atom. A crit. account is given of the controversy concerning pentaerythritol and other symmetrically substituted derivatives of CH_4, and it is shown that no case of a pyramidal C atom has yet been satisfactorily proved. It is found that the model now suggested will explain the symmetries, as detd. by means of x-rays, of other simple C compds., in some cases throwing light on anomalies revealed by such detns. GEORGE GLOCKLER

The structure of iron nitride, Fe_4N. R. BRILL, I. G. Farbenind. A.-G., Ludwigshafen. *Naturwissenschaften* **16,** 593–4(1928).—Hägg has claimed that N is taken up by Fe as a solid soln. Several years ago B. found on strongly overexposed x-ray diagrams of a nitride of compn. Fe_4N 4 very weak lines not originating from the face-centered Fe atom lattice, but indicating a regular distribution of N. The positions corresponding to the diagram are Fe: 0, 0, 0; $^1/_2$, 0, $^1/_2$; $^1/_2$, $^1/_2$, 0; 0, $^1/_2$, $^1/_2$ and N: $^1/_2$, $^1/_2$, $^1/_2$ with a cube dimension of 3.80 A. U. This means a chem. compd Fe_4N. B. J. C. VAN DER HOEVEN

The crystal structure of the alums. L. VEGARD AND E. ESP. *Ann. Physik* **85,** 1152–64(1928).—The structures of $NH_4Al(SO_4)_2.12H_2O$, $KAl(SO_4)_2.12H_2O$, $NH_4Fe(SO_4)_2.12H_2O$ and $KCr(SO_4)_2.12H_2O$ were studied by the Debye-Scherrer method. They are cubic with the following cube edges, resp.: 12.11 A. U., 12.08 A. U., 12.165 A. U., 12.03 A. U. The space group is T_h^6. There are 4 mols to the unit cell. The univalent and tervalent atoms lie on a NaCl type lattice in each eighth of the unit cell; a SO_4 group lies on the trigonal axis, the S atom and one of the O atoms lying on the axis and the other O atoms lying in a plane perpendicular to the axis. The O atoms of the H_2O mols. are arranged in cubic closest packing along the trigonal axis and next to the univalent metal atom. The basal plane of the sulfate group tetrahedron lies toward the water and not toward the tervalent metal atom. There are 11 parameters, which have not been quantitatively detd. R. L. HERSHEY

The structure of beryllium oxalate. L. HAVESTADT. *Z. anorg. allgem. Chem.* **171,** 351–4(1928).—$Be(COO)_2.3H_2O$ is orthorhombic. The unit cell contains 4 mols and has the dimensions, a = 6.37 A. U., b = 7.53 A. U., c = 12.45 A. U. The space group is V_h^{16}. The method of the rotating crystal was used in the analysis. R. L. HERSHEY

The crystal structure of tetraethylammonium iodide. ISAMU NITTA. *Proc. Imp. Acad. Tokyo* **4,** 292–5(1928).—Laue and spectrometric measurements show that $N(C_2H_5)_4I$ is tetragonal body-centered with 2 mols. to the unit cell. The cell dimensions are: a = 8.85 A. U. and c = 6.93 A. U., d is calcd. to be 1.56. The space group is probably S''. The intensity data are not sufficient for the exact placing of the atoms in the cell. R. L. HERSHEY

The crystal structure of tetraethylammonium iodide. R. W. G. WYCKOFF. Rockefeller Inst. for Med. Res. *Z. Krist.* **67,** 550–4(1928). (In English.)—Two mols. of $N(C_2H_5)_4I$ are contained in a tetragonal cell with the dimensions a = 8.87 and c = 6.95 A. U. The I atoms are body-centered. The N atoms, as centers of the $N(C_2H_5)_4$ groups are either body-centered or else similar to those in $N(CH_3)_4I$. (Cf. *C. A.* **22,** 2861.) L. S. RAMSDELL

Crystallographic investigation of some rare-earth nitrates. E. E. FLINT. *Trans. Inst. Econ. Mineral Met.* (Moscow) **1928,** No. 34, 59–72.—Goniometric and optical measurements are reported on the salts: $3Mg(NO_3)_2.2Ce(NO_3)_3.24H_2O$; $3Mg(NO_3)_2.2Nd(NO_3)_3.24H_2O$; $3Mg(NO_3)_2.2Pr(NO_3)_3.24H_2O$; $3Mg(NO_3)_2.2La(NO_3)_3.24H_2O$. Reference must be made to the original for numerical data. F. emphasizes the necessity of indicating the degree of precision of goniometric measurements. These crystals cannot be distinguished goniometrically; hence F. has taken especial care in the detn. of their n's. R. L. HERSHEY

The crystal structure of mercuric cyanide. R. FRICKE AND L. HAVESTADT. *Z.*

anorg. allgem. Chem. **171,** 344–50(1928).—$Hg(CN)_2$ is tetragonal. The unit cell dimensions are: $a = b = 9.74$ A. U., $c = 8.94$ A. U. It contains 8 mols. and is body-centered. The most probable space group is V_D^{12}. The x-ray method of the rotating crystal was used. R. L. HERSHEY

The crystal structure of titanium monoxide. H. BRÄKKEN. *Z. Krist.* **67,** 547–9 (1928).—TiO has a NaCl type of structure, with $a = 4.235$ A. U. The calcd. d. is 5.536. The data seem to indicate that the compd. is not ionized. L. S. RAMSDELL

The crystallography and optical properties of β-lactose. EDGAR T. WHERRY. *J. Wash. Acad. Sci.* **18,** 302–4(1928).—Crystals of β-lactose are transparent and colorless and belong to the holo-axial polar class of the monoclinic system. The axial ratio is $a:b:c = 0.817:1:0.377$; the acute monoclinic angle, μ, is 88°15′. The n's are: $\alpha = 1.542$, $\beta = 1.572$, $\gamma = 1.585$. A procedure for distinguishing by optical means, between α-lactose, β-lactose and sucrose is given. R. L. HERSHEY

Uniformly colored crystals, which form from melts sufficiently supercooled. G. TAMMANN AND F. LAASS. *Z. anorg. allgem. Chem.* **172,** 65–83(1928).—Homogeneously colored crystals were obtained by strong supercooling; they are not mixed crystals; the pigments are contained in minute particles distributed in a mass which is still seen to be homogeneous with a 500 times magnifying power. The following shows that even this mass is not a mol. mixt. (1) Above the eutectic temp. a sepn. occurs with the formation of the eutectic soln. (2) In the crystals which appear homogeneously colored, the pigments are not protected against the attack of non-colored satd. solns. (3) Colorless crystals ppt. out of less viscous (alc.) colored solns. Conclusion: The homogeneously colored crystals contain the dye as mol. conglomerates, not as mols. The high viscosity of the melting and the crystn. velocity cause an abnormal formation of the crystals. It is impossible to make any distinction between the crystals primarily sepd. and the eutectic. The dye does not envelop the crystals first sepd. in the eutectic, but disperses in smaller and smaller particles in the crystals, which cause a homogeneous coloration; the dichroism is to be referred to a regular repartition of the dye particles O. Lehman has mentioned colored crystals (*Wied. Ann* **51,** 47(1894)), which were obtained from alc. solns. Meconinic acid contains Me violet and probably the other dyes too, as mols, but phthalic acid does not, at least within certain limits. With increasing crystn. velocities, differences in the compn. of the melt decrease and also the differences in the crystals sepd. therefrom. With large crystn. velocities, the differences disappear completely. A. L. HENNE

Change of color of crystals at low temperatures. I. OBREIMOV AND W. J. DE HAAS. *Proc. Acad. Sci. Amsterdam* **31,** 353–6(1928).—See *C. A.* **22,** 1908. E. H.

The influence of urea on the crystal habit of sodium chloride. F. GILLE AND K. SPANGENBERG. *Z. Krist.* **65,** 204–50(1927).—The addn. of urea to NaCl solns. causes a marked fall in cond., which is due to formation of double salts as well as to increased viscosity. The double salt $NaCl.CO(NH_2)_2.H_2O$ occurs in platy orthorhombic crystals, optically positive, with optic angle = 37°, and with the 3 indices α, β, γ = 1.479, 1.485 and 1.543, resp The relative growth velocity in pure H_2O for NaCl is $v_{100}:v_{111}:v_{110} = 1:3.2:6.8$ and for soln. with 33.5 g. urea per 100 cc. 1:0.25:1.9. At a concn. of 5 g. urea per 100 cc. soln. the form (111) begins to appear with (100) and at 8.5 g. the form (111) without (100) is the end form. L. S. RAMSDELL

Solid solutions of chromium and nickel and of iron and nickel. F. C. BLAKE, JAMES LORD AND A. E. FOCKE. *Phys. Rev.* **29,** 206–7(1927).—Cr goes into the Ni lattice up to 63% Cr by wt., the max. distortion being 2.8%. From 63 to 100% Cr the Ni is in the face-centered Cr lattice, but this lattice being metastable at ordinary temps. most of the Cr seps out as body-centered Cr. In Fe and Ni, Fe distorts the Ni lattice up to 74% Fe by wt. after which the Ni is in the face-centered Fe lattice up to 100% Fe; but face-centered iron is stable only at high temps.; so most of the Fe seps. out at room temp. In both cases miscibility is complete, but there is overlapping between the regions of distorted face-centered Ni-Cr (or Ni-Fe) and body-centered Ni-Cr (or Ni-Fe). On account of the small difference in lattice between isomorphs of Cr, Ni and Fe, a higher precision in the x-ray method is necessary to det. whether the phase which separates out contains both methods in the body-centered state.
R. L. HERSHEY

Transformation in the lattice structure of metallic solid solutions. G. BORELIUS, C. H. JOHANSSON AND J. O. LINDE. Physik. Inst. techn. Hochschule, Stockholm. *Ann. Physik* **86,** 291–318(1928); cf. *C. A.* **20,** 1154; **21,** 2204.—Further and more refined measurements of the resistance of the solid soln. series Cu-Au and Cu-Pd have been made in an attempt to establish, definitely, the existence of a transition from a

statistical to an ordered distribution of the atoms on the lattice. Complete state and resistance diagrams are given for these 2 alloy series. The resistance-compn. diagrams for the Cu-Au series at 450° and for the Cu-Pd series at 600° as well as for the same series quenched from the higher temps., show no deviations from the smooth curve which indicates that under these conditions the distribution is statistical. When the alloys are slowly annealed, however, sharp diminutions in the resistance occur in the range of compns. represented by the at. relations 3 Cu : Au; Cu : Au; 3 Cu : Pd and Cu : Pd, which indicate that a transition has taken place between the statistical and ordered distribution. A marked temp.-resistance hysteresis was observed which reached its max. at the compns. represented by the above at. ratios. The transition and hysteresis phenomena have been considered on the basis of thermodynamic equil.

A. J. KING

A test of Tammann's theory of resistance limit with the system: gold-copper. A new point of view. M. LEBLANC, K. RICHTER AND E. SCHIEBOLD. *Ann. Physik* **86**, No. 7, 929–1005(1928); cf. *C. A.* **19**, 2891.—The accuracy of the $N/8$ mol. law of Tammann was tested by means of Au-Cu alloys which are well adapted for x-ray study and for the detn. of limits in resistance to soly. The prepn. of the alloys with varying Cu content and free from impurities is described. Samples of untempered alloys and samples tempered for 29 days at 840° were extd. with HNO_3 (sp. gr. 1.4) contg. 1% N_2O_5 first for 61 days and then for an addnl. 15 days at 22°. In the tempered alloys Cu showed a high resistance to the acid up to a Cu content of $^5/_8$ mol. fraction, at which compn the alloy dissolved almost completely. The untempered alloy showed a high resistance up to 4.8/8 mol. fraction, at which point the resistance dropped rather abruptly. When further extd. with HNO_3 (sp. gr. 1.5) at 22° for 14 days the untempered alloys did not dissolve further to any appreciable extent but the Cu in the tempered alloy with a Cu content of 4.8/8 mol. fraction dissolved appreciably. The extn. was continued for 14 days at 55°. There was little further soln. of the untempered samples. With the tempered samples only the alloy with a Cu content of 4.8/8 mol. fraction dissolved appreciably. At the end of the test both the tempered and untempered samples with a Cu content of 4.8/8 mol. fraction had lost practically all their Cu while the samples with a lower Cu content had lost very little. The original alloy leaflets had disintegrated into a powd. mass in all tempered samples. With the untempered samples this was not true of the samples with a Cu content of less than 4.8/8 mol. fraction. These results do not coincide with the Tammann theory. Temp. has a noticeable effect, the HNO_3 concn. exerts a strong influence, the resistant mixed crystals with a Cu content of 4.4/8 mol. fraction and less are dissolved to depth of almost 1000 atoms, and there is remarkably little difference between tempered and untempered alloys. A comprehensive x-ray study of the Cu-Au alloys was made and space lattice data are given. The cubic lattice for $^2/_8$, $^4/_8$ and $^6/_8$ mol. fraction of Cu as predicted by the Tammann theory was not confirmed. The relation between the limit of resistance and the space lattice structure of the Cu-Au alloys is discussed. An abs. limit of resistance, independent of the temp. and the character of the solvent is not believed to exist.

J. S. REICHERT

Strains and their removal by breaking and gliding. F. RINNE. *Z. Krist.* **64**, 537–9; *Physikal. Ber.* **8**, 735(1927).—Primary and secondary strains are distinguished and the phenomena in particles, atoms, mols., crystals, glass, atmospheric and geological processes considered in light of strains and their relief.

G. L. CLARK

The x-ray diagrams of liquids as an expression of the shape and arrangement of the molecules in the liquid state. J. R. KATZ. *Z. angew. Chem.* **41**, 329–40(1928).—Since so little is known concerning the relation between the so-called "amorphous spectra" given by liquids and the shape and arrangement of the mols., K. has undertaken a study of a large series of liquids, using org. compds. because their structure has been worked out from chem. evidence, and because homologous series are available. If the mols. are assumed to be spherical, $a = b$, where $a = (1/0.814)(\lambda/2 \sin \theta/2)$ and $b = 1.33\sqrt[3]{v}$, θ being the angle between the diffracted and the original x-ray beams and v the mol. vol. The deviation from this equation thus shows the deviation of the mols. from the spherical form; d, calcd. from the Bragg formula, is $0.814\,a$. However the derivation of the formula for a contains uncertainties. If the mols. of the liquid contain several like groups, two rings are obtained, the inner ring corresponding to the av. distance between the centers of mols., the outer to the distance of nearest approach of these like groups. If the mols. are rod- or disk-shaped, a large vol. change should occur on melting a solid unless the mols. are easily deformed and perhaps arranged at random, or, if rigid, arranged parallel in groups. K. considers that mols. must possess ordered arrangement in the liquid, since crystn. can take place so quickly on cooling.

Liquids whose mols. differ widely from the spherical form show two or more diffraction rings, and therefore must have groups of regularly arranged mols. in which two or more spacings due to mol. size are regularly repeated. These groups are arranged at random. In the cryst. state, the distance between the lattice planes does not necessarily give mol dimensions, and the axes of the mols. are not necessarily parallel to the axes of the crystal. The same is true of the liquid state. Thus the problem of detn. of mol. shape and size is complicated, in general. There is need of comparing results obtained from a very large no. of related compds. As examples of studies of this type, K. gives data on liquids whose mols. contain two rings, as naphthalene, quinoline, etc., for which, from Bragg's at. diams., the thickness of the mol. should be 3.0 to 3.8 A. U., depending on the form of the benzene model assumed. The x-ray diffraction patterns of these liquids show two rings, sometimes three. The diam. of the inner ring varies with the substance, and its a value agrees well with b as calcd. from mol. vol. The outer ring has nearly the same diam. for all, giving $d = 3.6_5$ A. U. in most cases, though sometimes as low as 3.3_5 or as high as 3.8. Benzene and phenol give halos with sharp borders corresponding to $d = 3.0$ A. U.; the introduction of several side chains as $-CH_3$, and other groups as $-NO_2$, $-Cl$, raise this value to about 3.6 A. U., the inner ring as before, varying with the substance. The simplest assumption concerning the common dimension 3.6_5 A. U. is that it measures the mol. thickness. As side chains are added, this dimension increases, the agreement between a and b becomes less exact, and the outer ring becomes more intense. Upon complete hydrogenation of a double ring mol. the outer ring disappears and but little remains of the diffuse blackening: if only one ring is hydrogenated, the outer ring disappears, but the diffuse blackening remains Hydrogenation weakens the rigid disk form of these mols. and makes them more easily deformed and perhaps thicker. $\Delta^{9,11}$-Octalin, because of the double bond between the C atoms common to the two rings, should have more rigidity than $\Delta^{2,3}$-octalin and should give a halo with a more sharply defined border. This was exptly. verified No clear difference could be detected between *cis* and *trans* decalins. Complete hydrogenation of di- and trimethylbenzenes causes disappearance of the outer ring. 3,5-Dimethylcyclohexanol in the *cis* form gives a stronger halo than in the *trans* form; with the corresponding ketones, the *cis* form gives a sharply bordered halo, while that of the *trans* form is weaker and more diffuse. This is attributed to the more regular disk shape of the *cis* form. Of the large C rings, K. has studied the series of Ruzicka's cyclic ketones, C_8 to C_{11}, and C_{15}. For the lower members, a_1 and b agree well, and the outer ring does not appear. As one goes up the series, the deviation between a_1 and b becomes greater and the outer ring increases in intensity until for C_{15} it is more intense than the inner. The values of d calcd. from the outer ring range from 3.25 A. U. for C_7 to 4.53 for C_{15}. Normal aliphatic compds. give an outer ring corresponding to $d = 4.5$ A. U., $a = 5.5$, if the chain contains more than 4 C atoms. The inner ring is much weaker, because of the less frequently repeated spacing along the long dimension of the mol This, and the fact that this ring lies so near the central beam make its accurate measurement difficult, especially for the longer-chain mols. The d value for the inner ring increases a definite amt. for each C added to the chain. This increment has one value for liquid acids of even no. of C atoms, and another for those of odd no., in agreement with Trillat's work on cryst. acids. The value of d_1 must be an expression of mol length, that of d_2, the av. diam. of the cross section, for with a branched-chain isomer, d_1 is smaller, while d_2 is larger. From these values, K. concludes that the mols. must be rigid, and therefore, to account for the small vol. change on melting, must lie together in groups. No inner ring was detected with normal amines, ketones and paraffins, if present it is much weaker than with other O-contg. compds. O-contg. groups are more polar and supposedly cause a more definite arrangement of the mols., perhaps an asmocn. The value of the long spacing seems to correspond to the length of two mols in case of normal compds. (alcs., acids, aldehydes) and also with cyclic alcs., though the existence of double mols. with the tertiary alcs. is doubtful. These show an increment per CH_2 added, which is only half that found for the normal alcs. Two possibilities are suggested to explain the occurrence of two or more diffraction rings: either the mols. lie in small groups with lattice-like structure, or the interferences are due to repeated oscillations of the mols. But the intensities of these diffraction rings are of the same order of magnitude as crystal interferences. Hence if they are due to such oscillations, the mols. must at all times be touching others on all sides, *i. e.*, possess a lattice-like arrangement. The shape and size of the mols. necessarily affect this lattice like array, and a study of the x-ray interferences can thus give an insight into mol. shape and size. While the results may seem to contradict the evidence adduced from some chem. reactions, it must be remembered that the x-rays here show the form of

the large percentage of mols., and a deformity of a very small fraction would not be detected. G. R. Yohe

X-ray investigation of lauric acid. Rudolf Brill and Kurt H. Meyer. *Z. Krist* **67**, 570–82(1928).—Lauric acid was obtained in platy crystals, optically positive, with weak double refraction, and an index of about 1.48. The x-ray data indicate a monoclinic cell, with *a* 9.76, *b* 4.98, *c* 36.9, 48, 68, containing 4 mols. L. S. R.

Influence of x-rays on the crystallization of bismuth. A. Rostagni. Univ. Torino. *Atti accad. Lincei* [6], **7**, 649–53(1928).—Since the influence of x-rays and γ-rays on certain properties of Bi and allied metals reported by Adinolfi (cf. *C. A*. **19,** 1224, 3216; *Boll. soc. nat.* **38,** 114 (1926)) and by Campa (*C. A*. **20,** 3262; **21,** 3004) may have depended upon accidental factors, expts. on the influence of x-rays on the thermoelec. power and on the sp. heat of Bi were carried out. The app. and technic, which are described in detail, allowed measurements of these properties in identical samples of Bi which had been fused and then crystd. with and without irradiation by x-rays during the crystn. There was no difference either between the thermoelec. power or the sp. heat of the samples which had been irradiated and those which had not been. As judged by 2 important properties of metals, x-rays do not therefore alter the structure of Bi during its crystn. The *sp. heat* was 0.03023–0.03030 (cf. Schimpff, *C. A*. **4,** 1129). C. C. Davis

Some physical properties of gas-freed sulfur. C. Coleridge Farr and D. B. Macleod. *Proc. Roy. Soc.* (London) **A118,** 534–41(1928).—S purified in the ordinary way, by simple distn., may contain SO_2, traces of H_2SO_4, and H_2S. Its viscosity varies and depends on its heat history. This and other phys. properties are not const. because of the retardation of inner equil. between the S modifications present. S with a const. and definite viscosity would be definite in its other phys. properties. Com. S on distn. shows a considerable residue of carbonaceous matter. The S used was prepd. from S crystd. from CS_2 and from com. flowers of S. It was then distd. in an all-glass app. in CO_2 followed by distn. *in vacuo*. The viscosity was detd. at the temp. of greatest variation, 163–169° and reproducible values of viscosity were obtained with sulfurs of various heat treatments. "Mother of Pearl" S, S_{III}, from the purified S, contrary to the usual behavior, seps. with great ease and is very stable. Its natural f. p. is 103.8–103.9°, the ideal m. p. *i. e.*, of S_{III} in contact with S, melts at about 107°. The natural f. p. of monoclinic S was 114.6°. Efforts to obtain rhombic S failed. The pure S can be supercooled to 80° and at this temp. it is 4 times as viscous as at 155°. S. L. B. E.

The validity of gas equations. V. W. Herz. *Z. Elektrochem.* **34,** 360–2(1928); cf. *C. A.* **22,** 3326.—Exptl. data for hexane, octane, diisobutyl, cyclohexane, C_6H_6, Et_2O, Me, Et and Pr formates, CCl_4, MeOH, EtOH, PrOH, $SnCl_4$, NH_3, SO_2, Cl_2 A, N_2 and O_2 show that the vol. of 1 g. calcd. by the perfect gas law is about 3.75 times larger than that found by expt. At $^9/_{10}$ the crit. temp. (abs.) (T_c) this ratio is 1.45 and at $^1/_3$ T_c (abs.) the ratio is equal to 1. J. H. Perry

Friction coefficient for gas flow through small glass tubes. Marshall Elliott. Univ. of Texas. *Ind. Eng. Chem.* **20,** 923–4(1928).—The most generally suitable type of flowmeter is a capillary glass tube connected to T's at both ends. With proper functional relations or with exact calibration the rate of gas flow through such a tube can be detd. from the observed pressure drop between the two T's. From the Fannin equation $\Delta h = 2\,fLu^2/gd$, where h = loss of head between 2 ends of capillary expressed in feet of the fluid actually flowing, due account being taken of the effect of temp. and pressure; L = length of tube in feet; u = velocity of flow in ft./sec.; d = diam. of tube in feet; g = const. for acceleration of gravity; and f = so-called "friction factor"—the only arbitrary const. involved in the equation. A curve was obtained by the calibration of a large no. of flowmeters; the process can be reversed and the values from the curve used instead of the calibration when a flowmeter is desired, a series of calcns. requiring about 30 min. taking the place of a calibration requiring 3 or 4 hrs. with no sacrifice in accuracy. A table showing values obtained with air, H, CO_2 and CH_4, and the curve itself, are presented. W. C. Ebaugh

The vapor pressure of barium oxide. M. deKay Thompson and W. G. Armstrong. *Trans. Am. Electrochem. Soc.* **54** (preprint), 4 pp.(1928).—The vapor pressure of Ba oxide was measured between 1280° and 1470° by satg. a measured vol. of air with the vapor of the oxide, and detg. the amt. of oxide required: 1100°, 0.03 mm. Hg; 1200°, 0.12 mm. Hg; 1300°, 0.42 mm. Hg; 1400° 1.6 mm. Hg; 1500° 5.6 mm. Hg; 1600°, 20.0 mm. Hg; 1880°, 760 mm. Hg. C. G. F.

Porosity and permeability as characteristics of porous bodies. O. Philipp. *Chem. Fabr.* **1928,** 152–3; cf. Howe and Hudson, *C. A.* **21,** 2967.—An app. is described for detn. of permeability by measuring the vol. of air which passes through per sq. m. per

min. at a pressure of 25 mm. The results are compared for porous plates of the same thickness prepd. by binding particles of definite sizes with varying proportions of binder. B. C. A.

Experimental researches on the diffusion of hydrogen through nickel. VICTOR LOMBARD. *J. chim. phys.* **25**, 501–30(1928).—A description of an app. and procedures for accurately measuring the rate of diffusion of hydrogen through Ni under carefully controlled conditions. The rate of diffusion varies with the temp., and with the structure of the metal. It is not affected by the presence of water vapor or small quantities of oxygen. It varies as the sq. root of the H pressure, even when admixed with large quantities of N. It is inversely proportional to the thickness of the metal. From the standpoint of permeability to a gas two layers of the metal behave like a single layer with the same thickness as the two layers. J. S. REICHERT

Rapid and micro-determination of specific gravity. E. H. RIESENFELD. *Chem.-Ztg.* **52**, 641(1928).—For the detn. of sp. gr. of small quantities of liquids a simple letter scale is employed, graduated to read directly in sp. gr. The sample is placed in a pycnometer of about 5-cc. capacity, and the instrument is provided with a normal weight as a tare. When loaded with the pycnometer and normal wt. the pointer stands at 1.000. The sp. gr. can be read directly to one unit in the third decimal place, with an accuracy greater than that of a hydrometer and a speed greater than that with a Mohr sp. gr. balance. W. C. EBAUGH

The work of the International Bureau of Physical-Chemical Standards. III. Study of the physical constants of twenty organic compounds. J. TIMMERMANS AND F. MARTIN. Univ. de Bruxelles. *J. chim. phys.* **25**, 411–51(1928).—A continuation of the work previously reported (*C. A.* **21**, 1038–9) carried out with the same accuracy. The following data were detd.:

	B. p.	M. p.	d_{15}	d_{30}	n^{15}_{D}	Viscosity 15°	Viscosity 30°
Hexane	68.80	−95.1	0.66380	0.65055	1.37787	337	278
Octane	125.80	−57.0	0.70637	0.69430	1.40007	579	472
Butylbenzene	183.10	−81.2	0.86475	0.85245	1.49210	1090	895
Bromoform	149.55	8.05	2.90350	2.86460	1.60053	2152	1741
Ethyl iodide	72.30	−111.1	1.94707	1.91326	1.51682	617	540
Ethylene chloride	83.50	−35.5	1.26000	1.23831	1.44759	887	730
Isopropyl chloride	34.8	−117.0	0.86797	0.84910	1.38110	335	286
Isopropyl bromide	59.35	−89.0	1.32223	1.29720	1.42847	536	437
Secondary butyl chloride	68.25	−131.3	0.87880	0.86210	1.39940	439	363
Isobutyl bromide	91.40		1.27197	1.24980	1.43914	679	567
Butyl alcohol	118.0	−90.2	0.81337	0.80206	1.40118	3379	2271
Isobutyl alcohol	108.1		0.80576	0.79437	1.39768	4703	2876
Secondary butyl alcohol	99.50		0.81089	0.79898	1.39946	4210	3180
Diethyl ether	34.6	−116.3	0.71925	0.70205	1.35555	247	215
Diamyl ether	187.5	−69.3	0.78695	0.77505	1.41392	1188	922
Methylal	42.30	−105.0	0.86645	0.84745	1.35626	340	325
Acetone	56.20		0.79597	0.77933	1.36157	337	295
Methyl ethyl ketone	79.60	−86.6	0.81010	0.79452	1.38140	423	365
Ethylene chlorohydrin	128.6	−67.5	1.20720	1.20190	1.44380	3913	2688
Carbon disulfide	46.25	−116.8	1.27055	1.24817	1.63189	380	

The m. p. and d. values for the 9th and the 13th compds. are for the racemic form In addn. n is given for He red, yellow, green and violet, and for H_{α}, H_{β} and Hg for most of the compds.; values for mol. refraction are also given. E. G. VANDENBOSCHE

Physical properties of liquids as functions of temperature. G. ANTONOFF. *J. chim. phys.* **25**, 497–500(1928).—The physical properties of a liquid when precisely measured show a discontinuity in their variation with the temp. This discontinuity is often very small but it is distinctly beyond the limit of exptl. error. For benzene the curve for the latent heat of vaporization between 100° and 210° shows a break at about 145°, and the d. curve for temps. between 0° and 130° shows a break at about 55°. These breaks are explained by the hypothesis that the elementary constituents consisting of complex aggregates of mols. undergo changes at relatively low temps. J. S. REICHERT

A simple method of determining absolute viscosity of paraffin oils, vegetable oils, lubricating oils, etc. P. E. RAASCHOU. *Dansk. Tids. Farm.* **2**, 134–9(1928).—An

app. for viscosity detns. is described and illustrated. The app. consists essentially of a waterbath, for const. temp. equipped with a hand stirrer and a thermometer. In this bath is suspended a medium-sized test tube containing the sample, a thermometer and a capillary tube, having 3 marks on its stem The size of the capillary is detd. by the approx. viscosity of the oil. At the upper end of this capillary tube is fitted a rubber bulb having an opening at its top. To make a detn. lower the capillary tube until the surface of the oil sample is at the lowest mark. Then by means of the rubber bulb draw oil up into the tube, until the level of the oil is above the highest, or 3rd mark. Release the finger covering the hole in the rubber bulb and with a stop watch note the time it takes for the surface of the oil to drop from mark 3 to mark 2. The abs. viscosity expressed in poiseuilles is given by $[\eta] = K.t$, where K is a const. detd. from a liquid of known viscosity and t = time in seconds. Effects of temp., adhesion of oil to walls of capillary, etc., are discussed. O. A. NELSON

The mechanism of exchanges in distilling and rectifying equipment. CH. MARILLER. *Chimie et industrie* Special No., 134–40(April, 1928).—A general discussion of the mechanism of the exchanges taking place in the trays of distg. and rectifying columns, the problems of distn. and condensation being considered as applications of the laws of equil. between 2 phases. The question of ebullition or non-ebullition on the trays of rectifying columns is gone into in detail, by taking into account the effects of the reciprocal solubilities of the vapors and liquid, the effects of salts or other compds. (*e g.*, glycerol in the case of the production of abs. alc.), and the effects of diffusion of the vapors into the liquid. M. concludes that the mechanism of the rectification of vapors is essentially the same as that of the removal of C_6H_6 or light hydrocarbons from gases by systematic washing in a suitable solvent. A. PAPINEAU-COUTURE

Simple graphical method for determining the course of the natural distillation process. H. BRANDES. *Chem. Fabr.* **1928**, 261–2.—The construction of a curve showing the relation between the percentages of alc. in the vapor and in the residual liquid in the flask during the course of distg. a mixt. of alc. and water without the aid of a fractionating column is described, and a geometrical construction is given for deriving from this curve a curve showing the percentage of alc. in the residue at any stage of the distn. B. C. A.

Freezing point of ethyl alcohol-water mixtures. D. N. TARASENKOV. *Z. angew. Chem* 41, 704(1928).—The f. ps. of mixts. of EtOH and water contg. from 5.1 to 74.7% of alc by wt. have been detd., the freezing-mixt. being contained in a Dewar flask. With higher concns. of alc. the soln. is too viscous for accurate measurement. The freezing curve indicates the sepn. of a cryst. hydrate. The following data are recorded, the figures in parentheses being wt.-% of alc.: (5.1) − 2.1°, (9.3) − 4.1°, (14.2) − 6.7°, (17.8) − 10.2°, (24.4) − 15.2°, (29) − 19.1°, (33.3) − 24.2°, (37.6) − 28.4°, (43.0) − 33°, (46.7) − 35.4°, (51.9) − 38°, (56.3) − 42°, (61.4) − 45°, (66.1) − 48°, (70.2) − 56°, (74.7) − 67°. B. C. A.

The surface tension of liquid metals. III. The surface tension of mercury. L. L. BIRCUMSHAW. *Phil. Mag.* [7], **6**, 510–25(1928).—The surface tension of Hg has been detd. by the method of max. bubble pressure. Investigations were made regarding the influence of the material of the tube used, the phys. condition of the surface of the end of the tube from which the bubbles are blown, and the nature of the gas used for blowing the bubbles. The effect of hanging the bubble on the end of the tube for various lengths of time and the time taken to blow the bubbles has also been examd. Glass tubes appear to give slightly higher results than tubes made of silica, and in the case of the latter it was found that roughening the ends (tips) of the tubes was essential before concordant results could be obtained. This did not appear to be necessary with glass tubes. The nature of the gas used for blowing the bubbles, with the exception of O_2, has practically no influence on the values found. Accurate results could not be obtained with O_2 when glass tubes were used, but with silica tubes concordant values were found. With one set of glass tubes used, hanging the bubble on the end of the tube for various lengths of time always resulted in a lowering of the figure found, and this lowering increased with the length of the time. With another glass app. this effect was practically absent. GEORGE GLOCKLER

Variation of surface tension of oils with the temperature. GEORGE WINCHESTER. Rutgers Univ. *Phys. Rev.* **29**, 911–2(1927).—The surface tensions of several oils were measured by the max.-bubble-pressure method at temps. up to nearly 300°. Below 150° the surface tension decreases faster than the temp. rises. No numerical data are given. W. W. STIFLER

The surface tension of mixtures of ethyl alcohol and water. I. K. I. ALEKSEEVA. *Z. physik. Chem.* **134**, 46–74(1928).—The surface tension of solns. of EtOH in H_2O vary-

ing in concn. from 87 to 99.7% at intervals of 0.1% was detd. by the method of observing the max. pressure in small bubbles. The surface tension was found to vary continuously with the concn. within the limits of exptl. error, namely 0.1%. The measurements are to be repeated with the mixts. under the influence of electromagnetic waves to see whether a stepwise variation will result analogous to the relation found by Colley (*C. A.* **4**, 15) for the index of refraction of electromagnetic waves. F. L. Browne

Studies in adhesion. III. Mixture of two lubricants. Millicent Nottage. Dept. of Scientific and Industrial Research, London. *Proc. Roy. Soc.* (London) **A118**, 607–16(1928); cf. *C. A.* **22**, 3812.—The lubricants used were palmitic acid and the paraffin $C_{30}H_{62}$, palmitic acid and cetyl alc., and $C_{30}H_{62}$ and phenanthrene. A clean steel cylinder was placed on a clean steel plate and warmed in clean air to above the m. p. of the lubricants. Melted lubricants were then allowed to be drawn into the cylinder by capillarity, a pool was formed, the temp. was kept const. until equil. was reached, the heat was then cut off and the lubricant allowed to crystallize and the joint was broken at 18°. M. p. and adhesion are plotted against the percentage of mols present. The adhesion of admixed substances for all compns is greater than of pure substance. At 3 palmitic: 1 paraffin there is a max. on the adhesion and a min. on the m.-p. curve. Palmitic acid + cetyl alc. shows 3 transitions in adhesion but only two in melting, the unpaired transition point probably corresponding to the presence of cetyl palmitate. Phenanthrene, + $C_{30}H_{62}$ shows a const. adhesion from 46.6 to 73.5 mol percent $C_{30}H_{62}$. More than this produces a fall. Values for adhesion are given in all cases and there are 12 micrographs of the lubricants S. L. B. Etherton

Determination of the surface area of adsorbers. Karl Horovitz. Rockefeller Inst. *Phys. Rev.* **29**, 617(1927).—Certain fatty compds. form unimol. layers covering the available surfaces. The results of the surface tension of Na oleate solns. show that it is adsorbed in a unimol. layer at the interface of 2 phases. By assuming this unimol layer of Na oleate is formed on every adsorber, it is possible to det. the adsorber area from the quantity of Na oleate adsorbed and the known dimensions of the Na oleate mol. The ring method was used to det the adsorption of Na oleate. The surface of different charcoals detd. by this method was of the order of some 100 per sq mg. charcoal, the comparative surface areas for charcoals of different origin being in good agreement with detns. by other methods and other investigators S. L. B. Etherton

Adsorption in binary systems. L. S. Lévy. *Compt. rend.* **186**, 1619–21(1928); cf. Townsend, *Compt. rend.* **186**, 55(1928).—Measurements of adsorption by MnO_2 from the binary systems Fe–Ni and Cu–Ni indicated that Freundlich's equation ($c = KC^m$) held for either one of the two substances if the concns. of the other were kept const. The consts. K and m were functions of the equil. concn. of the second substance. These consts. were evaluated graphically for the 2 systems. R. L. Dodge

Life history of an adsorbed atom of cesium. J. A. Becker. Bell Tel. Labs. *Phys. Rev.* **29**, 364(1927); cf. *C. A.* **21**, 2426.—At equil. the av. life of an absorbed atom is N/A, N being the no. of absorbed atoms and A the arrival rate. With the filament at 660° K. and the arrival rate that corresponding to Cs at 20°, the surface is covered and an atom remains on it for one sec. Atoms move from one part of the edge to the other. Atoms cover distances a million times their diam. L. D. R.

Selective adsorption from gaseous mixtures by a mercury surface formed in the mixture. M. L. Oliphant. *Phil. Mag.* [7], **6**, 422–33(1928).—Exptl. evidence is presented which indicates that an expanding Hg surface selectively adsorbs CO_2 from a mixt. of CO_2 with an excess of H_2 or A. The measurements show that within the limits of the exptl. error the CO_2 so adsorbed forms a monomol. layer over the surface of the Hg. George Glockler

Important factors in the study of adsorption from solutions. K. C. Sen. *Z. anorg. allgem. Chem.* **171**, 275–80(1928).—Adsorption by unit wt. of adsorbent is influenced by the quantity of adsorbent and by the initial concn. and the total vol. of soln employed. This is particularly the case when there is strong chem. affinity between adsorbent and adsorbed substance. R. L. Dodge

The influence of the volume of solution and the mass of adsorbent on the adsorption of arsenious acid by metal hydroxides. K. C. Sen. Allahabad Univ. *Z. anorg. allgem. Chem.* **174**, 75–81(1928); cf. preceding abstract.—The adsorption of As_2O_3 by $Zr(OH)_4$ was measured for vols. of soln. between 50 and 200 cc. and with amts. of hydroxide between 0.27 and 1.08 g. For the same final concn. of solute the adsorption per g. of adsorbent is greater the smaller the total vol. of soln. The amt. of adsorption per g. of adsorbent appeared to decrease as the amt. of adsorbent was increased although expts. on this point were not decisive. Similar results were obtained with Al and Cr hydroxides. R. L. Dodge

Influence of volume on the adsorption of arsenious acid by iron and aluminum hydroxides. K. C. Sen. Allahabad Univ. *Z. anorg. allgem. Chem.* **174,** 82–90 (1928); cf. preceding abstr.—The "consts." for the Freundlich adsorption isotherm for As_2O_3 on either Fe or Al hydroxide are not true consts. if the adsorption is measured with different vols. of soln. Therefore no particular theoretical significance can be ascribed to the adsorption isotherm consts. Adsorption of $CuSO_4$ or MnO_2 was very definitely influenced by the mass of the adsorbent, but no similar effect with As_2O_3 on Fe and Al hydroxides was observed. R. L. Dodge

The electrical condition of hot surfaces during the adsorption of gases. II. A nickel surface at temperatures up to 850°. G. I. Finch and J. C. Stimson. *Proc. Roy. Soc.* (London) **A120,** 235–46(1928); cf. *C. A.* **22,** 8.—The elec. charge on a Ni sheet was measured at various pressures and temps. when the Ni was exposed to vacuum, H, O, CO_2, detonating gas, H_2O, N, A and mixts. of these gases. The results support the hypothesis previously advanced to account for the charging of Au and Ag surfaces under the same conditions. The Ni sheet becomes electrically charged when heated *in vacuo* or in contact with a gas. The magnitude of the *in vacuo* charge depends on the temp. of the metal and its previous history. After normalizing the surface by 1 or more oxidations and reductions, the charge due to a gas is characteristic of the gas and dependent on the temp. but independent of the pressure. The Ni sheet becomes covered with an oxide layer when heated in O, but the oxidized surface has the same *in vacuo* charge as the reduced O-free surface. The value of the charge due to the reaction product of a mixt. of combining gases is identical, at all temps., with that due to the original mixt. A or N, dild. with 2% O, gives the full charge due to either one of the 2 gases. Five different ways that gas can be absorbed on a hot metal surface are described. R. L. Dodge

Adsorption phenomena in solutions. XII. Electroösmosis. Lidie Orlova. *Z. physik. Chem.* **134,** 345–52(1928).—A systematic study was made of the influence on the electroösmosis with respect to kaolin, a negative diaphragm, and to Al_2O_3, a positive diaphragm, of increasing concns. of different electrolytes, including acids, bases, and salts. For kaolin the curves of electroösmosis *vs.* electrolyte concn. exhibit more or less pronounced maxima, in agreement with other authors. For Al_2O_3 several of the curves have minima. At low electrolyte concns. the sequences of the curves seldom are the reverse of those for kaolin. The positively charged surface of Al_2O_3 is more easily discharged and therefore less stable than the negative surface of kaolin. At high concns. of electrolyte the sequences of the curves for kaolin and for Al_2O_3 are always the same, as would be expected from adsorption and coagulation behavior. The characteristic course of the curves can be explained in general by the coincidence of primary and secondary adsorption, the former increasing the surface charge and the latter decreasing it. F. L. Browne

Some properties of colloidal lead. Helen Quincy Woodard. Memorial Hosp., N. Y. *J. Am. Chem. Soc.* **50,** 1835–40(1928).—The concn. of stable colloidal Pb prepd. by the Bredig method is proportional to the current used and to the p_H of the soln. at the beginning of the dispersion. The concn. of Pb rises to a max. with increasing concn. of stabilizing electrolyte and then falls off again. Bredig colloidal Pb is compared with colloidal Au, Ag and Pt with respect to the relation between the amt. of metal disintegrated and the concn. of sol produced and to the settling under gravity. F. L. Browne

Nuclear silver hydrosols. A. Galecki and R. Kempf. *Roczniki Chem.* **8,** 40–3 (1928), cf. *C. A.* **21,** 3512.—The yellow nuclear hydrosol, Ag_p analogous to Zsigmondy's Au_p was prepd. by pouring into a 250-cc. Jena flask 100 cc. thrice-distd. water (Ag condenser) 1.5 cc. 0.1% $AgNO_3$, 0.5 cc. NH_3 (d. 0.925), heating to the b. p. and adding slowly dropwise 5–6 cc. of an ether soln. of yellow P. The sol is quite stable. When prepd. at room temp. it begins to fade on the 2nd day and is discolored after a few days. P restores the color only passingly. Both sols are perfectly amicroscopic, free from ions and light-sensitive. Cond. and cataphoretic migration velocity (neg. charge) show a definite decrease with the age. *N* and 0.1 *N* $BaCl_2$, $AlCl_3$ and $Al_2(SO_4)_3$ ppt. a jelly, more flaky or granular according to diln. It gradually turns gray. Au is not reduced when seeded with Ag_p. The latter can even instantly stop the usual reduction to Au_F. Ag solns. are reduced to Ag_F, by both Au_p and Ag_p. With the latter the dispersion is less, the stability greater. The proper no. of cc. Ag_p is added to 50 cc. thrice-distd. water, 25 cc. 0.1% $AgNO_3$, 0.5 cc. NH_3 s. g. 0.925 and 5.0 cc. 0.3% HCHO, and the mixt. is heated to 80° with const. stirring The bright yellow color with an azure-green fluorescence reminds of Grabowski's (*Ber.* **36,** 1215 (1903)) Ag sols. The stability is greater with fresh Ag_p. At room temp. the formation of Ag_F,

with fresh Ag_p takes 15 hrs., with an Ag_p 8 days old it hardly takes place. The sols are ion-free and light-sensitive. Cond. and migration velocity decrease with age. On standing several weeks to months sols prepd. with 1–20 cc. Ag_p gradually became turbid, lost the fluorescence and finally turned milky sepg. black Ag. Ag_{P_p} is less sensitive to electrolytes than Ag_p. MARY JACOBSEN

Colloid chemistry. XXIII. Physico-chemical investigation of thorium oxide sol. WOLFGANG PAULI AND ALBERT PETERS *Z. physik. Chem.* **135**, 1–23(1928); cf. *C. A.* **22**, 525.—Pure concd. ThO_2 sols, with Cl as contra-ion, have been prepd. by peptization in hot and cold soln. The Cl and ThO_2 contents have been detd. potentiometrically and measurements of the conductivities of the sols have been carried out. Sols obtained by hot peptization yield very low values for the activity of the Cl ion, an effect attributed to reciprocal interionic forces between the Cl ions and the colloid particles. The activity coeffs. and the diln. equiv. cond. relationship exhibit marked anomalies, which can be explained in terms of modern views, whereas the classical theory leads to very improbable values for the colloid-ion mobilities. Substitution of the contra-ion by the addn. of various Ag salts indicates that complex asymmetric univalent ions have a greater effect than simple ions in changing the activity coeff. B. C. A.

The use of tartaric acid in the preparation of electronegative sols. A. B. DUMANSKIĬ AND A. G. KNIGA. *J. Russ. Phys.-Chem. Soc.* **60**, 229–36(1928).—By warming 2 *N* *d*-$(CH(OH)CO_2H)_2$ with increasing amts. of SnO_2 and TiO_2, complexes were obtained of increasing mol. wt. D. varies linearly with the concn. of the oxides. The viscosity curve is slightly convex towards the concn. axis. α_D increases with the concn. of the oxide, more so in the case of TiO_2; abrupt changes of slope take place at 5 $C_4H_6O_6$ SnO_2 and 4C $H_6O_6.TiO_2$. Sp. cond. increases rapidly up to a concn. of 10–20 "millimols" per l. and then is practically const. F.-p. depression increases continuously with the concn., more so for TiO_2. Conclusion: Complex ions are formed, at first causing an increase in cond. and α_D; beyond a certain point their no. remains const. although the total no. of mols. grows, excess of the hydrated oxide being peptized by $C_4H_6O_6$. A Tyndall cone appears at this stage. A SnO_2 sol dialyzed until neutral contained 7 35 g. per l. and had the compn. $(SnO_2)_{243}$ $C_4H_6O_6$. The liminal values do not follow Schultze's rule. It is unchanged at 100°, but will not redisperse after freezing. SnO_2 is peptized by HCl, better by $H_2C_2O_4$ and most readily by KOH. Heating favors dispersion. BASIL C. SOYENKOFF

Silicic acids. IV. R. SCHWARZ AND H. RICHTER. *Ber.* **60B**, 2263–70(1927); cf. *C. A.* **19**, 941; **21**, 2624.—Fused mixts., corresponding in compn. with the formulas $Na_4Si_3O_8$ and $Na_2Si_3O_7$, become cryst. after long preservation at 500°, and then exhibit the radially arranged needles of a monotropic substance. They are, however, only mixts. of meta- and disilicate or disilicate and SiO_2, since the so-called granatic acid gives an x-ray spectrum very closely similar to that of disilicic acid, and its vapor-tension isotherms, like those of "trisilicic acid" (which appears to give an individual x-ray spectrum), do not give any indication of the presence of a hydrate of the required compn. Granatic and trisilicic acids cannot therefore be regarded as chem. individuals. The presence of definite hydrates is not shown by the vapor-tension isotherms of silicic acid gels obtained by cautious neutralization of 5% solns. of Na meta- and disilicates with HCl followed by thorough washing of the ppts. Dehydration of the gels by acetone under varied conditions results in the removal of water to a content of about 13%, thus indicating the presence of disilicic acid. Its production from Na metasilicate is explained by the displacement of the equil., $2Na_2SiO_3 + H_2O \rightleftharpoons Na_2Si_2O_5 + 2NaOH$, towards the right during neutralization with HCl. Addn. of $BaCl_2$ to solns. of Na meta- or disilicate or $NaHSiO_3$ results in the pptn. of a mixt. of Ba meta- and di-silicates; if a large excess of NaOH is present, homogeneous Ba metasilicate is pptd. Ba meta- and di-silicates are obtained from solns. of Li orthosilicate even in the presence of a large excess of LiOH. The SiO_3^{--} and $Si_2O_5^{--}$ ions appear to be only ones present in solns. of alkali silicates; they form an equil. which usually is largely in favor of the disilicate ion (cf. Hägg, *C. A.* 20, 3257). B. C. A.

Dispersoidological investigations. XVIII. Methods of obtaining fibrous precipitates of any substance; the structure of fibers in general and that of cellulose fibers in particular. P. P. VON WEIMARN, *et al.* *Repts. Imp. Ind. Research Inst. Osaka, Japan* **8**, 7–17(1927); cf. *C. A.* **22**, 873.—"Fibers" are defined as "aggregates of disperse particles whose length is several times the breadth and thickness." Any substance may be obtained in the fibrous form under suitable conditions, though the fibers may not be very strong or very durable. There are three ways of obtaining fibers: (1) pptn. of the substance from very concd. solns. of reagents in a medium in which it is practically insol., (2) pptn. under conditions favoring the formation of needle-shaped

crystals, and (3) aggregation of small rod-like particles into long fibers by the orienting effect of flowing in streams. Microscopic examn. of swollen and partly dispersed fibers of *cotton cellulose* show them to be made of concentric tubes of chem. different substances. The outer tube is a wax-like substance more resistant to reagents than the rest. The middle tube is predominantly cellulose but contains other admixtures. The inner tube, contg. the lumen is a plasmatic formation. There are transition layers between the tubes and the cellulose tube is itself further subdivided into a series of very thin tubes, the walls of which are made up of thin fibrils arranged parallel to each other along the length of the tubes. *Wood cellulose* fibers likewise consist of three concentric tubes of chemically different substances, the outer tube of which is more resistant to reagents. Somewhat similar results are reported by Ritter who worked directly upon wood fibers and tracheids. **XIX. "Pure" cellulose as a colloid.** *Ibid* 19–39.— Natural cellulose fibers have a superficial layer of fatty or waxy material that hinders dispergation in salt solns. and accounts for the differences in the ease of dispergation of different kinds of cellulose. By suitable mech. and chem. treatments the cutical layer can be removed, when the cellulose becomes easily dispersable. Raw cotton cellulose does not disperse in boiling, satd. NaCNS soln. but by prolonged extn. with petroleum ether, amyl alc., ethyl ether or xylene the cotton cellulose is rendered dispersable. Boiling for 18 hrs. in abs. xylene followed by 8 hrs'. extn. with ethyl ether gave a sample of cotton cellulose that was almost as rapidly dispersed in boiling, satd. NaCNS soln. as pure filter paper. A 1% soln. so prepd. formed a clear, transparent jelly on cooling. Cellulose cannot be considered pure until all cuticle and all of the inner layer of the fibers, representing walls of lumen, have been removed, and in addn. the structure of the fiber has been completely broken down by dispergation to remove admixtures. This can be done by pptg. cellulose from its dispersion in salt solns. by dilg. with water and purifying the ppt. by electrodialysis. **XX. Microscopic investigation of coarse-cellular or membranous jellies in polarized light.** *Ibid* 41–66.—Jellies of $BaSO_4$ were made by allowing $4N$ $MnSO_4$ and $4N$ $Ba(CNS)_2$ to interact and were then observed with the polarizing microscope between crossed nicols. Photomicrographs of the resulting "structures of vectorial aggregation" and "fluidal and streaming structures" are given. It is concluded that "no doubt whatever can arise regarding the aggregate-fluid-cryst state's being a perfectly universal state of matter." **XXI. The rubber-like state of matter in connection with a microscopic investigation of silk coagula in natural and polarized light.** *Ibid* 67–80.—Silk was obtained in the "aggregate-fluid-cryst. state" by pouring a strong soln. of natural silk in concd. aq. soln. of a "substance dispergator" into a soln. of a "substance aggregator." Photomicrographs of the resulting structures between crossed nicols are given. Silk solns. pass through a transition state in which they have the elastic properties of rubber. The examn. in polarized light indicates that the system then consists of fibrils in the form of spirals embedded in a very viscous liquid. On drawing out a thread the spirals stretch out into parallel threads which curl into spirals again on being released. A similar system of spiral fibrils in a viscous liquid is assumed for rubber and all substances having an elastic consistency. **XXII. Jellies and gelatinous precipitates, their classification, conditions of formation, structure, and industrial application.** *Ibid* 9, 13–196(1928).—"This paper is not a text-book on jellies. It is a systematic record of the chief results of many years' long exptl. and theoretical work on jellies." If a liquid assumes throughout its mass a half-solid, elastic consistency, keeping at the same time in more or less degree the former transparency, we may call the resulting system a typical jelly. Jellies are classified: (1) according to the method of formation as *network* jellies, like gelatin, that gelatinize uniformly throughout the mass, or *membranous* jellies that gelatinize only on definite interfaces between two liquids in the act of mixing; (2) according to the degree of dispersity of the primary particles as, in the case of network jellies, macro-, micro-, ultramicro- or subultramicro-cryst. jellies and in the case of membranous jellies ultramicro- or subultramicro cryst. jellies; (3) according to consistency as resin-like, paste, soft-elastic, or solid jellies (glasses); (4) according to concn. of disperse part; (5) according as they are temp.-reversible or temp.-irreversible. The necessary and sufficient conditions for the formation of membranous jellies are low soly. of the pptg. substance, high specific supersatn. or an equivalent condition, and absence of dispergating tendency. The less the soly. the longer the jelly lasts. A membranous jelly can sometimes be changed into a network jelly by shaking thoroughly. For the formation of network jellies the soly. must be low and the sp. supersatn. high, but in addn. there must be an abundant solvation of the surfaces of the disperse particles. The greater the solvation the lower the sp. supersatn. and the higher the soly. at which gelatination may take place. Illustrative

expts. with jellies of alk. earth metal sulfates in alc.-water mixts. are described. Network jellies and the walls of membranous jellies, when freshly formed, are as devoid of structure under the microscope or ultramicroscope as glass. On aging a granular structure may appear which is due to secondary aggregates of particles. Real colloidal jellies are in reality gatherings of ultramicro-crystals, which have more or less unorderly stuck together, and which by adsorbing and by taking into pores between them, have imbibed the mother soln. Illustration of this structure on macroscopic and microscopic scales are afforded resp. by a suspension of natural silk wadding in $MnSO_4$ soln. and by photomicrographs of coarse-disperse jellies of $SrSO_4$ in which the interlocking bundles of needle-shaped crystals can be seen. Substances sepg. as needle-shaped crystals form jellies much more readily than substances forming plate-shaped crystals. Mech. agitation may break down the structure of a jelly, reversibly if the torn parts can "heal" again, otherwise irreversibly. Gelatinous ppts. are intermediate cases between jellies and flocculent ppts. Gelatinous ppts. are made up of ultramicro-crystals with the surface layers strongly solvated either of themselves or by adsorption of other substances. Photomicrographs of gelatinous ppts. of Au are shown. Flakes of flocculent and gelatinous ppts. may be considered as secondary structure elements of jellies. F. L. Browne

The prevention of precipitation of some metal hydroxides from solution by sugars. K. C. Sen. Allahabad Univ. *Z. anorg. allgem. Chem.* **174**, 61-74(1928); cf. *J. Ind. Chem. Soc.* **4**, 117, 131(1927).—Cane sugar causes the peptization of the hydroxides of Zr, La, Y and U, when their pptn. from soln. by alkalies is attempted. Lactose and dextrose cause peptization of Zr and U, while levulose is effective with Zr, U and Y. The action of the sugars is sp. The min amt. of a sugar necessary to prevent pptn. depends on the vol. of soln. and amt. of alkali. The smaller the total vol. and the greater the alky., the smaller is the amt. of sugar necessary for peptization. Time also plays an important part. The influence of negative ions is also appreciable. R. L. Dodge

The protection of colloidal solutions. A. Boutaric. *J. chim. phys.* **25**, 120-41 (1928).—The protective influence of varying quantities of gum arabic, albumin, casein, starch, dextrin and gelatin on the stability of gamboge, mastic, and As_2S_3 sols in the presence of HCl, KCl and $BaCl_2$ has been studied. All types of action by the foreign substances are noted: protection, acceleration of flocculation, protection increasing with concn. of foreign substance to a max. with subsequent diminution, etc. The effect of "minute quantities" of electrolytes on these sols is also reported. The influence of the manner of addn. of the electrolyte is also investigated at length. No theoretical treatment whatever is attempted, and the results are reported in so diffuse a manner that it is impossible to abstract them. W. T. Richards

The behavior of some colloids toward iodine and the possibility of using it for the titration of colloids. Wilhelm Engelhardt. *Kolloid-Z.* **45**, 42-6(1928).—The purpose was to develop methods for detg. quant. the compn. of colloidal solns., *e. g.*, the proportions of colloidal metal and metal oxide in metal hydrosols. The behavior with (1) 0.1 *N* KI soln., (2) 0.1 *N* KI_3 soln., and (3) 0 1 *N* soln. of I in EtOH of the following colloids is described: Au sols prepd. by 14 methods, Ag sols (12 methods), Cu, Hg (5 methods), Cd, Zn, B, Pb, C, Bi (3 methods), Sb (2 methods), As (2 methods), Te, Se (4 methods), S (2 methods), Mn, Fe, Pt (4 methods), Pd (2 methods), Rh (2 methods). The following react promptly with I: Au, Ag, Cu, Hg, Cd, Zn, Pb, Bi, Sb, As and Te. Se reacts only with difficulty. The following do not react; B, C, S, Pt, Pd, Rh, Mn and Fe. A line may be drawn through the periodic table of elements dividing the elements that react with I from those that do not. Most metal sulfide sols react with I but most metal oxide sols do not. Those metal sols that react with I can be titrated provided that the course of the reaction can be governed and the end products recognized, and provided further that the colloid contains none of the reducing agent with which it may have been prepd. F. L. Browne

The colloid state of gelatin solutions and the influence of changes in temperature upon it. Max Frankel. *Kolloid-Z.* **45**, 355-66(1928).—Under mild exposure to temp. (incubator temp.) gelatin solns. undergo a profound change in colloid nature without change in chem. compn. The magnitude of the change depends upon the duration of the heating. The phenomenon is called dissociation. The decrease in viscosity, increase in diffusibility through membranes, and decrease in jelling power and optical rotation that accompany dissocn. were studied. In the action of pepsin on gelatin solns. of different degree of association the same end products always result, and the reactivity is greater the greater the dissocn. Gelatin solns. of const. proportions are obtained if the solns. are held at a const. temp. long enough. Under the con-

ditions employed this took 75 hrs. The influence of temp. is most marked between 5° and 40°. Const. proportions are reached more rapidly outside of these limits. A stable soln. is further dissociated on raising the temp. or associated on lowering it. Mild, temporary temp. changes are entirely reversible, but prolonged heating results in gradual changes of a permanent character. Solns. of different degree of association become more nearly alike on warming but differ again on cooling. F. L. Browne

The structure of gels. I. Colloidal solutions of a photopolymerization product of vinyl chloride that gives solid, waxy masses like vaseline, and jellies. Gilbert Flumiani. Univ. of Zagreb. *Kolloid-Z.* **45**, 152–5(1928).—Jellies of the photochem. polymerization product of vinyl chloride are simpler than those of such complex, indefinite substances as gelatin and agar and their study should therefore throw light on the general theory of jellies. The photoproduct of vinyl chloride gives transparent, elastic jellies in aniline, Peruvian balsam, rosemary oil, tetralin, $CHBr_3$ and $C_2H_4Br_2$ by swelling 24 hrs. in the liquid, melting at 80°, and cooling. Concd. jellies are optically empty in the ultramicroscope, dil. jellies show ultramicrons arranged in an orderly manner that increase in size on further diln. and slowly coagulate when the system is dild. to the fluidity of a sol. In castor oil, cedar oil, aged French turpentine, pine oil, camphor, and copaiba balsam it can be incorporated in much the same way but at somewhat higher temps. and gives masses that are waxy at high concn. and vaseline-like when more dil. Under the ultramicroscope they exhibit coarser micelles, irregularly distributed, that do not increase in size on further diln. The elastic jellies are held to be characterized by very high dispersity and by a state of tension between particles and dispersion medium. F. L. Browne

Plasticity. IV. Plastic materials from silica. Otto Ruff and Bruno Hirsch. Tech. Hochschule, Breslau. *Z. anorg. allgem. Chem.* **173**, 14–26(1928); cf. *C. A.* **18**, 1596.—A quartz contg. 98.8% SiO_2 and having a particle size of 2–8μ was used. By prolonged treatment with acid, washing, grinding, centrifuging, dialyzing and rapid drying *in vacuo*, samples of high purity and with a particle size of 1.2$\mu\mu$ (av. for sample A_3) were obtained. Samples of 50 g. each of these silica prepns. of varying particle size were treated with NaOH, HCl, HNO_3, H_2SO_4, $(COOH)_2$, H_3PO_4 and CH_3COOH in several concns. The samples treated with alkali did not mold satisfactorily, *i. e.*, cracks developed and the body adhered to the mold. Treatment with HCl gave much better results. In general, the finer particle size and the higher concn. of acid produced better molding qualities (plasticity, and min. shrinkage). Under similar conditions, treatment with HCl and HNO_3 of the same concns produced similar results. Bodies molded from slips treated with the other acids were not as satisfactory, showing that the H-ion concn. is the important factor. The effect of neutral salts in analogous treatment shows that the H-ion concn. as detd. by anions of the salts is here again the controlling factor. Neutral slips produced bodies that did not crack, provided the particle size was sufficiently small (1.2μ). Improvement in plastic properties is ascribed to adsorption of H^+. The actual amt. of H-ion adsorption was small and it was not established with certainty. The swelling effect increased to a max. at the highest concn. of HCl used. (6 *N* was obtained by passing in HCl gas.) The H-ion concn. of the superficially hydrated SiO_2 is p_H 4.85. The observations are explained on the assumption of a diffusion equil. of the mobile H-ion between the interior of the quartz grains and the dispersion medium and a hypothetical formation of polar mol. groups at the surfaces of the quartz particles ("cover formation"). This hypothesis is discussed in detail. A. J. Currier

The influence of salts on the viscosity of flaxseed mucilage. M. S. Dunin and F. M. Shemyakin. *Kolloid-Z.* **45**, 146–52(1928).—The aq. soln. of the mucilaginous material from flaxseed hulls has a high viscosity—relative viscosity 3.20 in 0.16% soln. The viscosity is decreased by addn. of NaCl, KCl, $CaCl_2$, Na_2SO_4, K_2SO_4, $NaNO_3$ and KNO_3 in concns. from 0.04 to 0.2 *N*. $MgSO_4$ decreases the viscosity in concns. from 0.001 to 0.1 *N* and increases it slowly at higher concns. K_2SO_4, $(NH_4)_2SO_4$, $ZnSO_4$ and $CaCl_2$ exhibit the rise in viscosity at higher concns. less markedly than $MgSO_4$. The special behavior of $MgSO_4$ is attributed to the influence of Mg on the swelling of plant colloids. F. L. Browne

The role of dielectric constant, polarization, and dipole moment in colloid systems, especially in non-aqueous dispersoids. I. Wo. Ostwald. *Kolloid-Z.* **45**, 56–82 (1928).—The dielec. const. plays a very important part in disperse systems composed of poorly conducting org. materials, but for the understanding of such systems account must also be taken of density, and refractive power, which together with the dielec. const. enter into the expressions for polarization and dipole moment according to modern theories of the dielec. structure of matter. A summary of these theories, particularly

of Debye's, is given. The important concepts and magnitudes are defined and methods of measuring them given. The data for about 250 substances, mostly org. liquids, are collected, partly from the literature and partly from new measurements. The discrepancies between the dipole moments obtained by different methods are discussed, especially the "single moments" (observed in vapor and dil. soln.) and "mass moments" (observed in the liquids). Simple hydrocarbons usually show slight orientation polarization. Halogenated derivs. exhibit marked dipole moments, especially in *o*- and *cis*-positions, but compds. like CCl_4 show little polarization. In alcs. the moment increases with the no of CH_2 groups. Aldehydes and ketones are characterized by high moments, ethers, amines and N bases by moderate moments Nitriles, cyanides and thiocyanates have high moments. Data for fatty acids are incomplete but the moments are greater than 1. In the chloroacetic acids the moment decreases with increasing no. of Cl atoms. Esters have moments between 1 2 and 2 0, increasing in homologous series. Mercaptans have marked moments but CS_2 a very small one. Highly associated liquids like H_2O, $C_6H_5NO_2$ and acetone vary greatly in the moments obtained by different methods, for example H_2O from 1.8 to 0.8 The highest moments known are for NO_2 compds. The different polarization magnitudes are plotted against dielec. const. For most of them, especially for the dipole moments, there is a marked max. at an intermediate value for the dielec. const. Liquids with a d. of about 0.8 occupy an exceptional position. Problems of dispersoid chem. for which the polarization magnitudes will be helpful are reviewed briefly. II. **The stability of weakly solvated, pure organosols.** *Ibid* 114–22.—A theory is advanced to account for the stability of metal organosols prepd. by the Svedberg elec. dispersion method The orientation polarization of the dispersion medium is the chief factor in the stability. Electrolytes play no part in these purely org. sols. The influence of traces of H_2O on chem. and colloid chem processes, for example in Baker's extremely dry liquids, is discussed. III. **The behavior of organosols containing electrolytes.** *Ibid* 331-45.—Although Errera's Pt alcosols contain some water and impurities, the orientation polarization plays an important part in their stability just as in the case of very pure organosols. All substances whose addn. does not tend to coagulate have high dielec. consts. and high dipole moments and the strongest coagulants are liquids having no, or only weak, dipole moments such as C_6H_6, C_6H_{14} and CCl_4 Errera's sulfide alcosols, which contain electrolytes, exhibit different behavior in that substances of high dipole moment like amyl alc. may coagulate and C_6H_6, C_6H_{14} and CCl_4 have a max coagulating effect at an intermediate concn. There is no min. in dielec const. of the mixts of alc with these liquids but there is a max. in the mol polarization of alc. in a dipole-free soln. corresponding to the optimum coagulation. The sulfide particles in the alcosols are in adsorption equil. with the electrolytes present, the adsorbed layer contg not only ions but alc. dipoles. It is not to be regarded as a solid double layer but as a diffuse "ion and dipole atmosphere" in the sense of Gouy, Debye, Huckel, etc. Addn. of other org. liquids results in desorption of ions below the stabilizing concn. and thus in coagulation. Theoretically there is a connection between adsorbability and dipole content corresponding to that between dipole content and soly. F. L. BROWNE

The electrochemistry of colloids. I. Electrochemical properties of silicic acid. ADOLPH I. RABINOVICH AND E. LASKIN. *Z. physik. Chem.* **134**, 387–405(1928).—SiO_2 sols were prepd. by Graham's method, electrodialyzed and concd. to 0.25 to 0.53% SiO_2. The sols were strongly acid with p_H as low as 3 23. The total amt of H^+ titrable with NaOH was detd both conductimetrically and potentiometrically. The free-H-ion concn. was also detd. by both methods. The values for total titrable H-ion detd. in the 2 ways agreed exactly those for free H^+, though not in exact agreement, were reasonably consistent. The dissocn. const. for colloidal H_2SiO_3 detd. from the form of the potentiometric titration curve was 2×10^{-4}, which is much higher than the dissocn. const. for truly dissolved H_2SiO_3, namely 10^{-9}. This is analogous to phenomena previously observed in As_2S_3 and mastic sols. The higher dissocn. const. of the colloidal form may be due to weakening of the bond between H^+ and SiO_3^{--} as a result of the forces of adsorption holding the SiO_3^{--} ions on the colloidal particle On dilg. SiO_2 sol further dissocn of H^+ takes place, giving the sol buffer characteristics The total titrable H^+ also increases on diln., indicating that some of the inner SiO_2 mols. in the colloidal particles become hydrated, that is, the SiO_2 hydrolyzes. F L B

The measurement of the electrokinetic potential on proteins by the streaming-potential method. DAVID R. BRIGGS. Univ. of Minn. *J. Am. Chem. Soc.* **50**, 2358-63 (1928).—"The streaming-potential method of measuring electrokinetic potentials was applied in a study of egg albumin by utilizing the property of the protein to adsorb on to a quartz surface so as to give that surface the properties of the protein. Data, upon

comparison with the work of Abramson with the same protein on quartz surfaces but by the cataphoresis method, show excellent agreement between the values of the zeta-potential obtained by the two methods between p_H 3.8 and 5.2. Divergence of the values of zeta-potential beyond this range is explained by the differences in the concn. of the electrolyte utilized in the two expts. and probably, to some extent, by the differing effects of the ions used." F. L. Browne

The solubility of aluminum bromide in carbon disulfide. H. H. Kavelér and C. J. Monroe. Mo. School of Mines and Met. *J. Am. Chem. Soc.* 50, 2421–6(1928). —Methods for the synthesis of large amts. of $AlBr_3$ (by Richards method, *C. A.* 15, 195), for sampling satd. solns. at const. temp., and for the analysis of anhyd. $AlBr_3$ are described. The $AlBr_3$ was prepd. from C. P. Al, and Br purified by distn. from chromic acid, KOH and KBr. The CS_2 used was shaken with Hg, distd. from anhyd. $CaCl_2$ and stored in contact with P_2O_5. The soly. of $AlBr_3$ in CS_2 was detd. for the temp. range: 0.1° to 85.0°, a few of the data being: 0.1°—17.0 mol. % $AlBr_4$; 20°—28.9; 30°—36.2; 50.1°—54.5; 70°—73.1; 81°—83.3; 85°—87.8. The high soly. of $AlBr_3$ in CS_2 is shown to be in accordance with the several rules derived from general hypotheses of soly. The soly.-temp. curve shows a change of slope between 70° and 71°, indicating the existence of 2 modifications of $AlBr_3$, which confirms previous work, Kendall, Crittenden and Miller (*C. A.* 17, 1914). Dil. solns. of $AlBr_3$ in CS_2 have conductivities more than 1000 times that of pure CS_2, although the solvent is a poor ionizing agent. J. H. P.

The constitution of magnesium acetate solutions. II. Evidence from vapor pressures. E. A. Goode, Noel S. Bayliss and Albert C. D. Rivett. Univ. of Melbourne. *J. Chem. Soc.* July 1928, 1950–5.—To explain the relations between concns. and viscosities, f. ps. and conductivities of solns. of Mg acetate in water, polymerization at higher concns. has been postulated (*C. A.* 20, 2794) as chelate ring formation where the Mg atom exercises a coördination no. of 4. This view is fully substantiated by vapor-pressure data at 25° obtained by the McBain and Salmon modification of the Cumming dew-point method. G. L. Clark

Viscosity measurements and the nature of the solutions of a few hydroxides in potassium and ammonium hydroxide. K. Mohanlal and N. R. Dhar. Allahabad Univ., India. *Z. anorg. allgem. Chem.* 174, 1–10(1928); cf. *C. A.* 20, 1158, 2141.—This is a study of the solns. of the hydroxides of Al, Cr, Sn, Zn, Pb, Be, Cu, Cd and Ag in KOH and NH_4OH, with the object of detg. whether they are true solns. or contain the hydroxides in colloidal form. To this end, viscosity measurements are made in N and 0.5N KOH and in N, 2N and 5N NH_4OH solns. at 30°. The viscosity of N KOH is 0.008954 and 0.5N KOH is 0.008462, while for the solns. of the metallic hydroxides the following results are obtained: In N KOH: M/40 Al_2O_3, 0.009055; M/9 ZnO, 0.009243; M/18 ZnO, 0.009153; M/42 Cr_2O_3, 0.009265; M/19 BeO, 0.009022; M/11 BeO, 0.009093; M/11.5 SnO_2, 0.009000; M/7 SnO_2, 0.009124; M/13.1 PbO, 0.009008; in 0.5N KOH: M/100 Al_2O_3, 0.008534; M/84 Cr_2O_3, 0.008943; M/38 BeO, 0.008509; M/13 SnO_2, 0.008502; M/19.7 PbO, 0.00853. The viscosity of N NH_4OH is 0.008211, 2N is 0.008360 and 5N is 0.008694, while the viscosity of the hydroxide solns. is as follows: In 2N NH_4OH: 0.22 g. CuO/100 cc., 0.008582; 0.1344 g. CdO/100 cc., 0.008421; 0.221 g. ZnO, 0.008495; 1.717 g. Ag_2O, 0.008631. The elec. cond. of similar solns. is also measured, the soln. of the metallic hydroxide showing decreased cond. Thus when 2.2 g. SnO_2 is dissolved in 100 cc. N KOH, cond. is diminished 13% and when 0.448 g. ZnO is dissolved in 100 cc. N KOH, cond. is reduced 7%. To obtain comparative values with acids which form true solns., viscosity and cond. are measured on addn. of HCl, boric and benzoic acids to KOH. Thus on adding M/3.6 boric acid to N KOH; viscosity is 0.009495 and sp. cond. is 0.1577; on adding M/18.5 benzoic acid to N KOH, viscosity is 0.009037 and sp. cond. is 0.2002; on adding 2.34 g. HCl to 100 cc. N KOH, viscosity is 0.008694. Conclusion: The hydroxides of Be, Al, Cr, Zn, Sn and Pb in KOH and the hydroxides of Cu, Cd, Zn and Ag in NH_4OH are partly present in a colloidal condition. The decrease in elec. cond. is explained as due to the adsorption of alkali by the hydroxide for its peptization and the replacement of OH ions by aluminate, chromite, stannate and similar ions. H. Stoertz

Crystallization of a metal from a solution of its salt. C. C. Kiplinger. Alliance Inst. of Applied Chemistry, Alliance, O. *J. Chem. Education* 5, 964(1928).—Thirty grams of powdered Sn, free from As, Cu and Zn, but with small traces of Pb and Fe, was covered with 50 cc. of concd. HCl. After at least 48 hrs. an equal vol. of H_2O was added. This was allowed to stand for a couple of hrs. and when observed at the end of this period showed long needle-like crystals growing out of the excess of Sn. On pouring off the $SnCl_2$ soln. and re-subjecting the excess of Sn to the action of a fresh

supply of HCl, etc., on diln. the crystals grew rapidly, reaching a length of 1 cm. in 5 min., and increasing to 3-4 cm. in about one hr. W. C. EBAUGH

Solubility of diethyldiphenylurea in water, in alcohol and in other organic solvents. LOUIS DESVERGNES. *Ann. chim. anal. chim. appl.* 10, 226-8(1928).—At 0°, 20°, 50° and 85°, 3, 8, 12 and 30 mg. of this substance dissolves in 100 g. of water. In 100 g. of pure alc. 72.67 and 515.2 g. dissolves at 20° and 50°, resp. If the alc. is less than 72° and when the temp. is above 50°, there are 2 layers of soln. formed with markedly different contents of solute. Soly. data are also given when the solvents are EtOAc, AcMe, MeOH, benzene, $CHCl_3$, Et_2O, pyridine, CS_2, CCl_4, toluene and *m*-xylene. W. T. H.

Researches on the theory of hydrates. E. N. GAPON. *J. chim. phys.* 25, 154-6 (1928).—The properties of hydrates are additive. The properties of 42 hydrates are compared by an empirical equation. It is concluded that the density of water in hydrates is not greater than that of ice. W. T. RICHARDS

Cryoscopic irregularities with phenols. GEO. M. RICHARDSON AND PHILIP W. ROBERTSON. Victoria Univ. College, Wellington, New Zealand. *J. Chem. Soc.* 1928, 1775-83.—The van't Hoff equation, $K = 0.02T^2/L$, does not hold for a series of alcs., phenols, anilines, anilides, amides, pyridine and quinoline, in phenol soln. The observed deviations seem to depend on internal pressure and polarity in accordance with the theory of Hildebrand. Derived phenols show in the binary mixts. marked divergencies not traceable to these causes. The present theories of solid solns. and of activity are unsatisfactory, though some theory of activity is required. A general relation is shown between changes in mol. vol. upon soln. and cryoscopic behavior, in agreement with deductions drawn from internal pressure data. *Densities* of phenols and other compds. were accurately detd. at 40° as follows: AcOH 1.0291, iso-Am acetate 0.8524, Et malonate 1.0349, allyl alc. 0.8166, benzyl alc. 1.0303, phenol 1.0586, *o*-cresol 1.0290, *m*-cresol 1.0184, *p*-cresol 1.0186, *o*-chlorophenol 1.2416, *p*-chlorophenol 1.2651, toluene 0.8498, *m*-xylene 0.8487. G. L. CLARK

The conductivity and viscosity of solutions of lithium nitrate in certain mixed solvents. J. L. WHITMAN AND S. R. SPENCER. *J. Am. Chem. Soc.* 50, 1840-4(1928).—The conductivities and viscosities of $LiNO_3$ in water, MeOH, EtOH and various mixts. of these solvents have been studied at 25°. A pronounced min. occurs in the cond.-compn. curve only for $MeOH-H_2O$ mixts. It is found difficult to account for this in terms of viscosity. The difficulty in drying $LiNO_3$ may have been a source of error in previous work. W. T. R.

The absolute hydration of H, Li, Na, K, Cl and Br ions in their normal solutions. J. BABOROVSKY, J. VELISEK AND A. WAGNER. *J. chim. phys.* 25, 452-81(1928).—The electrolytic transport of H_2O in the presence of a parchment membrane was studied for solns. of bromides and iodides. The following values were found for the true transference no. of the cation $(1 - N)$ and the no. of g. mols. of H_2O transported by 1 faraday (Ξ):

	1.02*N*-NaCl	1.03*N*-KCl	1.02*N*-LiCl	*N*-NaBr	*N*-KBr	*N*-LiBr	*N*-HCl
$1 - N$	0.395	0.498	0.316	0.399	0.483	0.327	0.874
Ξ	0.90	0.47	1.62	1.58	0.89	2.10	0.43

The effect of electroosmosis on the above values is thought to be negligible. The abs. ionic hydration calcd. are given in *C. A.* 22, 12. E. G. VANDENBOSCHE

The apparent hydration of ions. I. Densities and viscosities of saturated solutions of sodium and potassium chlorides in hydrochloric acid. JOHN W. INGHAM. Heriot-Watt College, Edinburgh. *J. Chem. Soc.* 1928, 1917-30.—The solubilities, ds. and viscosities have been detd. at 25° of K and Na chlorides in aq. solns. of HCl of concns. varying between 0 and 13.5 *N*. Complete dissocn. of acids and salts being assumed, a formula is developed connecting ds. with ionic concns., ionic soln. vols. and apparent d. of H_2O in the solns. This formula is used to calc. soln. vols. Solns. of equal Cl-ion concn. up to 9 *N* have either lower or higher viscosities than solns. of HCl alone according as they are satd. with KCl or NaCl. The soln. vols. deduced from ds. account for the viscosities of HCl alone and of KCl-HCl. No hydration of Cl-ions is indicated and the K-ions are hydrated only to a slight extent if at all. H-ions may be present as H_3O^+ but are probably not more highly hydrated. A hydration factor of about 2 is necessary to account for viscosities of NaCl solns. G. L. CLARK

The variation of the capillary action of solutions with time. H. M. TRIMBLE. Univ. of Michigan. *J. Phys. Chem.* 32, 1211-24(1928).—The conclusion of Washburn and Bigelow (*C. A.* 22, 2697) that the variation with time in the capillarity of binary solns. is due to a change in the concn. caused by the preferential evapn. of one

component is confirmed. The capillary rise of the solns.: CS_2-toluene, Et_2O-CCl_4, Me_2CO-toluene, Et_2O-toluene and Et_2O-Me_2CO were measured at 25° in glass tubes, the radii of which varied from 0.162 mm. to 2.54 mm. The solns. had a concn. of 0.5 mole fraction. The rate and magnitude of the change with time depends upon the size and length of the tube, being greater the less the tube length and the smaller the tube. When these factors are const. the nature of the change may be predicted roughly from a knowledge of the surface tensions, volatilities and ds. of the components of the soln. *E. g.*, with Et_2O-CCl_4 soln., because of the evapn. of the Et_2O leaving a liquid with higher surface tension, the height of the meniscus gradually increases with time. It then reaches a max. and decreases because of the increase in the d. of the soln. Convection currents which carry the liquid downward near the wall of the tube and upward in the center exist in the capillaries and hasten the evapn. The quantity of liquid lost, however, is very small. The results show that evapn. must be completely prevented if reliable data upon the surface tension of mixts. contg. 1 or more volatile components are to be obtained. H. F. JOHNSTONE

A study of superacid solutions. III. The titration and dilution curves of bases dissolved in acetic acid. NORRIS F. HALL AND TYRRELL H. WERNER. Harvard Univ. *J. Am. Chem. Soc.* **50**, 2367–86(1928); cf. *C. A.* **22**, 527.—Diagrams and tables are given which show the effect of the following influences on the shape of the titration curves of bases dissolved in AcOH: the nature of the titrating acid ($HClO_4$, H_2SO_4, HCl), the concn. and the strength of the base. The weaker bases give anomalous titration curves while the curves of bases which act like strong bases in H_2O conform to the theory of such titrations. The effect of diln. on the H-ion activity of solns. of bases were studied by the e. m. f. method and even the "strongest" bases are truly weak electrolytes in this solvent. The results demonstrate the effective constancy of the liquid junction potential between satd. aq. KCl and the various AcOH solns. used. The value of the e. m. f. method in studying the effect of diln. on dissocn. is emphasized. E. R. SMITH

The influence of the solvent on the mobility of electrolytic ions. R. T. LATTEY. *Phil. Mag.* [7], **6**, 258–70(1928).—The evidence adduced in favor of the application of Stokes's law to the motion of ions in a liquid is of various kinds, but the two main propositions put forward by L. in its favor are: For certain salts $\lambda_0\eta$ is approx. independent of the solvent. For a somewhat larger class of salts $\lambda_0\eta$, though different in different solvents, is approx. independent of temp. in a given solvent. However, in the majority of cases $\lambda_0\eta$ only approximates to constancy in solvents whose dielec. const. is low; for solvents like water, for which the dielec. const. is high, larger values of $\lambda_0\eta$ are found. It is thus suggested that $\lambda_0\eta$ is a function of the dielec. const. λ_0 = equiv. cond. η = viscosity. GEORGE GLOCKLER

The conductivity and state of ionization of aqueous solutions of hydrofluoric acid. MAURICE AUMÉRAS. *J. chim. phys.* **25**, 300–7(1928).—Pick (*C. A.* **7**, 297) obtained the const. value of 7.2×10^{-4} as the ionization const. for fairly concd. solns. of HF at 25°. From cond. measurements A. was unable to get a const. value but found the value less than that given by P. By the chem. method previously described (*J. chim. phys.* **24**, 24; cf. *C. A.* **21**, 3148), A. found the value of 16.7×10^{-4}. This is the correct value for the primary ionization, since the chem. method conceals all other equil. whereas such equil., as $(HF)(F)^-/(HF_2)^- = C$ affect the value calcd. from cond. measurements. E. G. VANDENBOSCHE

The cause of an error affecting conductivity measurements. MISS L. DE BROUCKERE. Univ. de Bruxelles. *J. chim. phys.* **25**, 294–9(1928).—One of the chief errors in measuring the cond. of solns. is due to the adsorption of solute by the Pt black of the electrodes. A cond. cell with freshly prepd. electrodes gave a change in cond. for *N*/100 NaCl from 1.189×10^{-3} to 1.181×10^{-3} mhos at 25° after 24 hrs. This same cell, filled with a new soln., gave a const. value of 1.189×10^{-3} mhos. When the electrodes were first placed in 0.01 *N* NaCl and then transferred to the cell filled with 0.1 *N* NaCl the cond. changed from 1.253×10^{-4} to 1.321×10^{-4} mhos after 24 hrs. The amt. of NaCl adsorbed detd. directly is almost identical with the amt. calcd. from the change in cond. Solns. of LiCl, KCl, $CuCl_2$ and $NiCl_2$ gave similar results. E. G. V.B.

Reduction potential of nicotinic acid. MASUZO SHIKATA AND ISAMU TACHI. *Chem. News* **137**, 126(1928); cf. *C. A.* **22**, 1894. G. CALINGAERT

Refractometric evidence relating to the condition of strong electrolytes in concentrated solutions. K. FAJANS, H. KOHNER AND W. GEFFCKEN. *Z. Electrochem.* **34**, 1–10(1928).—Previous work (cf. Fajans, *C. A.* **21**, 3539) is reviewed and discussed. Measurements of the refractivity of H_2SO_4 in solns. of concns. up to 95% have now been made. The refractivity falls slightly with increasing concn. up to 40 mol. %, but rises

gradually with further increase in concn. These effects are attributed, resp. to the processes (1) $SO_4^{--} + H_3O^+ = HSO_4^- + H_2O$ and (2) $HSO_4^- + H_3O^+ = H_2SO_4 + H_2O$. The conversion of the ion H_3O into water should increase the refractivity, but this effect is opposed by a larger decrease due to conversion of SO_4^{--} into HSO_4^- in (1) and by a smaller decrease due to conversion of HSO_4' into H_2SO_4 in (2). The actual changes in refractivity are very small. The general conclusion from refractometric evidence is that strong electrolytes are incompletely dissocd. in aq. solns. and that they differ only in degree from weak electrolytes, so that no sharp line of demarcation can be drawn between the two classes. The essential modifications of the classical theory which is necessitated by recent work lies in taking account of interionic forces in the quant. treatment of the subject. The recent work of Nernst (*C. A.* **22**, 342) and Naudé (*C. A.* **22**, 717) on heats of diln. leads to similar conclusions, but the refractometric data lead to the conclusion that at given concn. the degrees of dissocn. of LiCl and NaCl are of the same order of magnitude even up to 5*N*. The contrary conclusions of Nernst and Naudé are discussed. Bjerrum's theory of "ionic assocn." is also discussed and criticised. B. C. A.

Reduction potentials of pyridine. Masuzo Shikata and Isamu Tachi. *Chem. News* **137**, 133–4(1928); cf. *C. A.* **22**, 720. C. Calingaert

First dissociation constants of *s*-diphenylguanidine and *p*-phenylenediamine. P. Walden and H. Ulich. *Z. Elektrochem.* **34**, 25–8(1928).—The elec. cond. of very dil. solns. of *s*-diphenylguanidine in water of sp. cond. $0.4–1.2 \times 10^{-6}$ ohm^{-1} has been measured in a silica cell. Corrections for CO_2 in the water, for the electrostatic forces between the ions, and for the activity coeffs. of the ions are shown to be less than the exptl. error, and the first dissocn. const. of the base is found to be $(8.19 \pm 0.65) \times 10^{-5}$. It is said that the dissocn. consts. of bases can be accurately detd. by the cond. method provided that the cond. of the water is not greater than 5% of that of the solns. employed. Detns. of the H-ion concn. of the above solns. by electrometric or colorimetric methods gave only approx. values for the dissocn. const. but confirmed the order of its magnitude. From cond. measurements of more concd. solns. of *p*-phenylenediamine, its first dissocn. const. is found to be $(1.30 \pm 0.10) \times 10^{-8}$, in satisfactory agreement with previous detns. by the electrometric method. B. C. A.

The mechanism of homogeneous gas reactions. I. The effect of black-body radiation on a molecular beam of nitrogen pentoxide. F. O. Rice, H. C. Urey and R. N. Washburne. Johns Hopkins Univ. *J. Am. Chem. Soc.* **50**, 2402–12 (1928).—In the usual methods for studying reactions, the 3 factors which influence the decompn. are: the absorption and emission of radiation, intermol. collisions, and collisions with the walls. The first effect is isolated by allowing a mol. beam of N_2O_5 to pass through a furnace, within which approx. black-body radiation is maintained. The second effect is isolated by allowing 2 beams to impinge, although this was found impractical for expts. with N_2O_5 because the total no. of collisions is small and only a small fraction of this no. would result in active mols. The third effect is isolated by allowing the beam to impinge on a heated surface from which it is reflected to a surface cooled to liquid-air temps. Expts. on the effect of black-body radiation indicate that no decompn. occurs. The probability of absorption of radiation by the N_2O_5 mol. is calcd. and found to agree with expt. J. H. Perry

Homogeneous gas reactions at high concentrations. I. Decomposition of hydrogen iodide. Geo. B. Kistiakowsky. Princeton Univ. *J. Am. Chem. Soc.* **50**, 2315–32(1928).—The decompn. of gaseous HI has been studied at concns. ranging from 0.02 to 7 mols. per l. The rate of decompn. is bimol. throughout the whole concn. range and is not affected by intensive drying. At the higher concns. a correction for the vol. of the mols. is introduced in the calcn. of the no. of bimol. collisions. Calcns. of the rate of reaction indicate that the effective cross section of activated mols. in collisions leading to reaction are smaller than the av. kinetic cross section of mols. J. H. P.

The kinetics of the decomposition of calcium carbonate hexahydrate. B. Topley and J. Hume. *Proc. Roy. Soc.* (London) **A120**, 211–21(1928).—The velocity of the reaction $CaCO_3.6H_2O \rightleftharpoons CaCO_3 + 6H_2O$ was studied dilatometrically, and the temp. coeff. of the reaction measured between 0 and 25°. The increase in velocity with temp. was shown to be a true temp. coeff. of reaction rate. A kinetic mechanism involving the vibration frequency of ions in the calcite-hexahydrate interface is suggested. R. L. Dodge

Water concentration and the rate of hydrolysis of sucrose by invertase. J. M. Nelson and Maxwell P. Schubert. *J. Am. Chem. Soc.* **50**, 2188–93(1928).—The rates of hydrolysis of sucrose solns. by invertase were measured at 25° by observing the change in rotation of polarized light. The sucrose concn. was varied independently

of the H_2O by adding definite amts. of C_2H_5OH to the sucrose solns. The results indicate that the concn. of H_2O is the primary factor in detg. the velocity of hydrolysis when the concn. of sucrose is greater than 20%. The curve, velocity *vs.* sucrose concn., shows a max. at about 7% sucrose. This curve is the resultant of 2 effects (1) increasing formation of sucrose-invertase complex and (2) decrease in water concn. R. L. D.

The hydrolysis of sugar by acids—hydrogen-ion concentration and rate of hydrolysis. H. Colin and Miss A. Chaudun. *Bull. soc. chim.* **43**, 721–5(1928); cf. *C. A.* **21**, 1047, 3300; **22**, 1084.—No relation exists between the variations in the hydrolytic consts. of sugar solns. and the variations in the H-ion concns. When the salt of a strong acid, without a common ion, is added to the acid the rate of hydrolysis is increased, as is also the H-ion concn., but again the variations are not parallel. Hydrolysis cannot be considered as a monomol. reaction, due to the H-ions alone.
E. G. VandenBosche

Note on measurements of the rate of decomposition of nitrogen pentoxide at very low pressures. Albert G. Loomis and David F. Smith. *J. Am. Chem. Soc.* 50, 1864–9(1928).—The adsorption of N_2O_5 and the occlusion of O_2 on a Pyrex vessel at low pressures involves a considerable fraction of the total gas present. Previous experimenters who have disregarded this effect in measuring the rate of decompn. of N_2O_5 are therefore considered in error. W. T. Richards

The influence of intensive drying on the system: nitrogen peroxide–nitric oxide–oxygen. John Wm. Smith. Univ. College, London. *J. Chem. Soc.* **1928**, 1886–94.—When NO_2 is heated with P_2O_5 at least 3 reactions take place: an addn. compd., a dissocn. of NO_2 into NO and O to a greater extent than in moist gases, and a greater rate of decompn. of NO into its elements than normal, by catalysis from the large surface of P_2O_5. A temp. of 300° and prolonged heating favor the third reaction. NO_2 intensively dried at ordinary temp. did not dissoc to any extent to NO and O at 550° but at 620° it reverted completely to the normal form, probably because of a superficial decompn. of the glass. In the dried gas the polymerization of colored NO_2 to colorless N_2O_4 is retarded. G. L. Clark

Reactions in the solid condition at high temperatures. IV. Reaction between basic and acid oxides and carbonates and method of compound formation. Wilhelm Jander. Univ. of Würzburg. *Z. anorg. allgem. Chem.* **174**, 11–23(1928); cf. *C. A.* 22, 1085—When solid substances react, a reaction layer is first formed between the surfaces in contact and further reaction only proceeds as one or both components diffuse through this layer. This process is studied for the following reactions: $BaCO_3$ + WO_3, $BaCO_3$ + MoO_3, $CaCO_3$ + WO_3, PbO + WO_3, PbO + MoO_3, $BaCO_3$ + SiO_2. In each case the proportion of the 2 substances is varied over a wide range and the reaction mixt. is heated for several hrs. In the case of $BaCO_3$ and WO_3, $BaWO_4$ is the only compd. formed, a slight excess of WO_3 over that required always being found, due probably to the formation of a poly compd. and soln. of this in the normal compd. In the case of $BaCO_3$ and MoO_3, $BaMoO_4$ is likewise the only product, and here too an excess of MoO_3 is found, while in the reaction between $CaCO_3$ and WO_3 the compd. formed is $CaWO_4$ contg. a slight excess of WO_3. In the reaction between PbO and the acid oxides the normal tungstate and molybdate are formed, but the product now contains a slight excess of PbO, indicating its slight soly. in $PbMoO_4$ or $PbWO_4$. In the reaction between $BaCO_3$ and SiO_2 the reaction mixts. are heated from a few hrs. to 3 days at 950°. With an excess of $BaCO_3$ the principal product is the orthosilicate, while with an excess of quartz the metasilicate is the chief product. The results indicate that diffusion through the surface reaction layer is responsible for completion of the reaction, and this is made possible only by the soly. of one of the components in the compd. formed in the reaction. H. Stoertz

Neodymium selenate. John Albert Newton Friend and Arthur Albert Round. *J. Chem. Soc.* **1928**, 1820–2.—The formation of the following forms of Nd selenate are described: $Nd_2(SeO_4)_3$ anhyd., $Nd_2(SeO_4)_3.5H_2O$, $Nd_2(SeO_4)_3.8H_2O$, and $Nd_2(SeO_4)_3.12H_2O$. The Nd salt is intermediate in hydrate formation between the Pr and Sa salts. L. L. Quill

Action of fluorine on aqueous solutions of chromium and manganese salts. Friedrich Fichter and Ernst Brunner. *J. Chem. Soc.* **1928**, 1862–8.—The oxidizing effect of F in prepg. persulfates, perphosphates, etc., is reviewed, and is shown to be at least as great as that of the Pt anode. A theoretical discussion is included. The oxidation of Cr alum giving chromic acid, and the reduction of $K_2Cr_2O_7$ to chromic salts by the action of F is described, with an explanation of the apparently contradictory behavior. The oxidation of MnF_2 and $MnSO_4$ is described. MnF_4 could not be prepd. by this method, as is also the case with anodic oxidation. In all cases, F proved to be

at least as strong an oxidizing agent as a Pt anode, and the observations throw a new light on the mechanism of such oxidations. The relation between electrochem. and ordinary chem oxidation is shown. L. L. Q.

Thermal decomposition of ethane, ethylene, propane, and propylene. F. E. Frey and David F. Smith. Bur. of Mines *Ind. Eng Chem.* **20**, 948-51(1928).—The decompn. of C_3H_8 on a Ni catalyst takes place very rapidly at 350° and 400°, yielding C, a large amt. of CH_4, and some H. A Cu catalyst has little effect on C_3H_8 at these temps. At 568° a Pt catalyst has a slight decompg. effect, giving C, H_2, CH_4, C_2H_4, C_2H_6 and C_3H_6. SiO_2 has little catalytic effect on C_2H_6 at 575°, and the only decompn. products are C_2H_4 and H_2. Polymerization of C_2H_4 at 575° in SiO_2 yields C_3H_6, CH_4, C_2H_6 and higher hydrocarbons Under the same conditions C_3H_6 yields C_4H_8, CH_4, C_2H_4 and higher hydrocarbons. T. S. Carswell

Recent investigations in the field of heterogeneous catalysis. Walter Frankenburger. I G. Farbenind A.-G *Z. angew. Chem.* **41**, 523-31, 561-7(1928).—A bibliography of 287 references is included. E. H.

Influence of (area of) active surface of a nickel catalyst on the velocity of hydrogenation of oils. S. Józsa. *Z. angew Chem.* **41**, 767-71(1928).—The velocity of hydrogenation of neutral sunflower oil increases with concn. of catalysts for all the concns. used (1-10%). There is no apparent relationship between the reaction rate and the surface area of the catalyst, detd. by Mitscherlich's method, because, as the catalysts were prepd. in different ways, it was improbable that for catalysts with equal Ni content, the amt. of active Ni present was the same. In order to overcome this difficulty, a single catalyst was used, but its surface was varied by using it in conjunction with different carriers. A definite quantity of Ni formate was added to the oil, and 2% of active charcoal. Expts. were carried out to show that the charcoal acted only as a carrier, the catalyst being distributed over its surface. The carriers used comprised active charcoal, two varieties of animal charcoal, blood charcoal, infusorial earth, wood charcoal and pumice. It was found that the velocity of reaction was proportional to the surface area of the catalyst, so that the value of a catalyst can be found by detg. its surface area. B. C. A.

Disintegration of the nickel catalyst. E. Mashkilleison. *Oil & Fat Industry* (Russia) 1928, No. 1, 24-7.—Metallic Ni pptd. on infusorial earth was sent through a colloid mill in 8 different portions, and disintegrated for 20 min. to 2 hrs. and 20 min. The sample taken out after 20 min. was composed of particles between 0.004 and 0.12 mm., the grain gradually decreasing; it reached for the 8th sample 0.003-0.004 mm. A check on hydrogenation proved that the coarse catalyst was more efficient than the finely disintegrated one. *Conclusion:* The catalyst layer is removed from the filler when sent through the mill, decreasing the surface and the activity. To obtain a finer catalyst with a large surface the filler must be disintegrated as far as possible and then the catalyst pptd. A. A. Boehtlingk

Thermal decomposition of ammonia upon mixed surfaces of tungsten and platinum. Robert E. Burk. Cornell Univ. *Proc. Nat. Acad. Sci.* **14**, 601-2(1928); cf. *C. A.* **22**, 343.—Contact catalysts accelerate reactions by lowering the heat of activation of the reactants. This effect could be produced (1) by distorting the atoms with a resulting weakening of the relevant bond, or (2) by bodily sepg. the atoms forming the bond. Previous expts. designed to study the importance of mechanism (1) were not completely satisfactory. The second mechanism was tested by measuring the velocity of decompn. of NH_3 on filaments having a mixed surface of W and Pt. Not only did the mixed surface cause a greater velocity of decompn. than the same area of either Pt or W alone, but the temp. coeff. was decidedly smaller for the mixed surfaces. Since W probably adsorbs N more strongly than H, and since the reverse is probably true for Pt the results are in complete agreement with expectations on the basis of mechanism (2). R. L. Dodge

The negative catalysis of autoxidation. Antioxygenic activity. (Messel memorial contribution.) Charles Moureu and Charles Dufraisse. *Chemistry and Industry* **47**, 819-28(1928).—Antioxygenic activity (neg. catalysis) is the inhibition of oxidation and pro-oxygenic activity (pos. catalysis) is the acceleration of oxidation. Antioxygenic activity has been shown to be a common phenomenon that is of fundamental concern in nature. Phenols retard the transformation of acrolein into disacryl, *e. g.*, 1 part of hydroquinone per 10,000 acrolein. The addn. of a trace of pyrogallol renders O_2 inert toward a third substance which itself is easily oxidized when pure. The direction of the catalysis, pos. or neg., is dependent on the conditions of the expt. and not on the nature of the catalyst, *e. g.*, $MeNH_2.HI$ acts as an antioxygen toward C_6H_5CHO, but as a pro-oxygen toward styrene; ethylxanthamide inhibits the

autoxidation of aq. Na_2SO_3 solns. if the latter are slightly alk., but accelerates oxidation if the solns. are slightly acid. The catalytic properties of a substance are related to its susceptibility toward oxidation, *e. g.*, P_4S_3, which is used in matches on account of its great reactivity toward O_2, acts as an effective antioxygen toward C_6H_5CHO at a diln. of 1 part per 1000. It has been shown that the catalytic effect is situated in that part of the mol. that is most easily oxidized. Any oxidizable substance, whether its reactivity toward O_2 is slight or considerable, should be an autoxidative catalyst under the proper conditions. I_2 and many I_2 compds. are positive catalysts (pro-oxygens) in the autoxidation of styrene and in the oxidation of linseed oil. Green MnS accelerates the autoxidation of C_6H_5CHO, and P_4S_3, C_6H_5SH and Sb_2S_3 accelerate that of styrene, while MnS, and C_6H_5SH accelerate the autoxidation of oil of turpentine and P_4S_3 that of linseed oil. Pro-oxygenic activities are generally not very intense, but some cases are noted where the velocity of autoxidation is increased more than 100 fold. I_2 is a strong antioxygen toward C_6H_5CHO, but is a pro-oxygen toward styrene; CHI_3 is pro-oxygenic toward styrene and an anti-oxygen toward furfurole; P_4S_3 is an antioxygen to C_6H_5CHO and a pro-oxygen to linseed oil; C_6H_5SH is an antioxygen to C_6H_5CHO and a pro-oxygen to turpentine: S and ethylene disulfide are antioxygens to Na_2SO_3 (1 to 10) when faintly alk. and pro-oxygens when slightly acid. In most such inversions of catalysis, the strongest antioxygen generally becomes the strongest pro-oxygen, *e. g.*, $CH_3NH_2.HI$ is a very active antioxygen to acrolein and is a pro-oxygen of the same order of intensity toward styrene. In the autoxidation catalysis of a substance the sign of catalysis often changes during the expt., *e. g.*, I_2 and its compds. are such catalysts; also, P_4S_3 is first an antioxygen and then a pro-oxygen toward turpentine. Thiophenol acts similarly toward linseed oil. The theory that autoxidation is due to a positive catalyst, and that it is possible to destroy its catalytic effect by the addn. of small quantities of other substances is of doubtful general validity. The inactivating action of hydroquinone on acrolein, if it exists, is insufficient to account for the observed antioxygenic activity. M. and D. offer the following explanation of antioxygenic activity: The peroxide, A (O_2), oxidizes the antioxygen, B, to the peroxide, B (O), while it is changed to another peroxide, A (O). The 2 peroxides, A (O) and B (O) are mutually antagonistic and destroy each other with the consequent regeneration of the 3 original components A, B and O_2 in their original state. The following facts prove that O_2 combined with acrolein, and not free O_2, is the agent which directly produces the change. If acrolein is freed from all O_2 by evacuation, its condensation proceeds just as in the presence of air, which indicates that the catalyst is not free O_2 and that mere contact with O_2 inoculates acrolein with a condensation agent. Further, the catalyst is not a volatile O_2 compd., because if the acrolein is partly distd. during condensation, it is found in the residue. If the acrolein containing a trace of an antioxygen, which prevents oxidation is exposed to air, no condensation occurs. Since it is not free O_2, it must be combined O_2 which catalyzes the condensation, and this combined O_2 must be a peroxide, either the primary A (O), or some product of it. Two types of antioxygens are stipulated: those possessing (1) a protective action and (2) those giving no effect. The reaction: $CH_3CHO \longrightarrow$ paraldehyde is not inhibited by antioxygens, and therefore O_2 does not cause this change. The polymerization of CCl_3CHO to metachloral is inhibited by antioxygens and here O_2 must cause the change. Furfural remains colorless when a trace of hydroquinone is added and therefore O_2 must be at least one of the causes for its discoloration. Since the drying of linseed oil may be inhibited by an antioxygen, O_2 must be the cause. *Ibid* 848–54.—The action of the natural antioxygens in raw *rubber* in protecting it from rapid destruction is fortuitously reënforced during its manipulation by antioxygens: (1) during smoking by the pyrogenic products of wood (pyrocatechol and derivs.); (2) during vulcanization with accelerators; and (3) by the addn. of "more oxidizable substances than rubber itself." These facts are addnl. evidence that the aging of rubber is due to oxidation. The problems of *knocking* and the action of *anti-detonants* are discussed and the anti-detonant and antioxygenic actions are correlated. Oxidations at high and low temps. resemble one another in that both are hindered by the same substances. C_2H_4, CO, and $(CN)_2$, which are negative catalysts in the combustion of H_2 with a Pt catalyst at ordinary temp., also prevent the explosion of the same mixt. by a spark. The film, screen, and buffer theories of anti-detonant action are tacitly rejected, for general applicability. The "poisoning" theory of the action of catalytic inhibitors (traces of gaseous inhibitors for a Pt catalyst) is rejected because these substances, which hinder the reactions in the presence of elec. sparks, cannot be spoken of as a "poisoning" of the spark. The "neutralization," the "direct inactivation" and the partial combustion theories are not of general application. Each of the theories is valuable only in a particular

example for which it is suggested. M. and D. state that the action of anti-detonants is that of antioxygenic catalysts which oppose the interaction of the fuel and the O. All previous theories have erroneously assumed that anti-detonant action occurs in the gas phase. The real seat of action is in the liquid phase and also that of the "knocking," especially in slightly volatile fuels. Anti-detonants hinder the formation of peroxide by an antioxygenic action. This theory is corroborated by: (1) the sudden elevation of the pressure, produced by knocking, is similar to that in the explosion of org. peroxides; (2) the production of a deposit of C during knocking is similar to the action of peroxides; (3) the increase of the elec. cond. of the combustion gases with the intensity of knocking which is a consequence of autoxidation; (4) conditions which favor knocking also favor autoxidation; (6) the "cold flames" of Perkins are a manifestation of autoxidation, and there is a close parallelism of the tendency of liquids to knock and their tendency to give the Perkin flames; and (6) the existence of pro-detonant activity is foreseen by the authors' theory of autoxidation. Combustible liquids autoxidize in the liquid phase to form peroxides which is demonstrable. Anti-detonants show an antioxygenic action in the autoxidation of heated autoxidizable liquids. In this autoxidation of heated substances the same catalyst may vary in its action toward different autoxidizable substances. Similarly, the same catalyst may be very effective for one fuel and almost inert, or even pro-detonant toward another. Small variations of the conditions may lead to the inversion of the action of the catalyst.

J. H. PERRY

Chemical interactions corresponding to the constant of mass action, being a function of the volume and masses of the constituents, as well as of the temperature and catalytic action. R. D. KLEEMAN. *Phil. Mag.* [7], **6**, 195-203(1928).—K. asserted previously (*C. A.* **22**, 308) that the const. of mass action is a function of the vol., mass and temp. of a reacting gaseous system. Now he obtains the further result that a dense substance in contact with a gaseous reaction of which it occludes to a certain extent one or more of the constituents, renders the const. of mass action a function of the vol and masses of the constituents. A catalytic agent thus is not only likely to change the velocities of the various changes continually going on in the reacting mixt., but the value of the const. of mass action as well, and to an extent depending on the vol. and masses of the constituents of the reacting mixt.

GEORGE GLOCKLER

Equilibrium constants of the reactions $CO + 3H_2 \rightleftharpoons CH_4 + H_2O$; $CO_2 + 4H_2 \rightleftharpoons CH_4 + 2H_2O$; and $2CO + 2H_2 \rightleftharpoons CH_4 + CO_2$. K. M. CHAKRAVARTY. *Z. Elektrochem.* **34**, 22-5(1928).—Consts for the above equilibria at temps. ranging from 800° to 1300° have been calcd (*a*) from the variation with temp. of the equil. consts. for $C + 2H_2 \rightleftharpoons CH_4$; $2CO \rightleftharpoons C + CO_2$; and $CO_2 + H_2 \rightleftharpoons CO + H_2O$, and (*b*) from the heats of reaction and the sp heats and chem consts. of reactants and products. The figures obtained are compared and discussed.

B. C. A.

The reciprocal salt pair $MgSO_4$-$Na_2(NO_3)_2$-H_2O. I. ALFRED BENRATH, H. PITZLER, N. ILIEFF, W. BEU, A. SCHLOEMER, J CLERMONT, S. KOJITSCH AND H. BENRATH. Aachen Tech. Hochschule. *Z. anorg. allgem. Chem.* **170**, 257-87(1928).—The isotherms of the system $MgSO_4$-$Na_2(NO_3)_2$-H_2O are studied at 15°, 25°, 50° and 97°. Equil. is insured by allowing solns at 15° to stand for 14 days, solns. at higher temp. a somewhat shorter time. Values of d are detd. by means of a weighing pipet. Space models of each isotherm are constructed and in each case the 4 binary systems are detd in detail: $MgSO_4$-$Mg(NO_3)_2$-H_2O, $Mg(NO_3)_2$-$Na_2(NO_3)_2$-H_2O, $Na_2(NO_3)_2$-Na_2SO_4-H_2O, Na_2SO_4-$MgSO_4$-H_2O. At 15°, the only double salt which occurs is *darapskite*, Na_2SO_4.$NaNO_3$.H_2O. Na_2SO_4 is present as Glauber's salt, $MgSO_4$ as bitter salt, $Mg(NO_3)_2$ as hexahydrate and $Na_2(NO_3)_2$ in the H_2O-free form. The sulfates take up the greatest space in the diagram. At 25° both darapskite and *astrakanite*, $MgSO_4$.Na_2SO_4.$4H_2O$, are present. At 50° darapskite has nearly vanished, the zone of astrakanite has enormously increased and Glauber's salt and bitter salt have been replaced by *thenardite* (Na_2SO_4) and $MgSO_4$.$6H_2O$. At 97° the $Mg(NO_3)_2$ field has vanished. In the place of astrakanite the H_2O-free double salts $MgSO_4$.Na_2SO_4 and $MgSO_4$.$3Na_2SO_4$ (*vanthoffite*) are found. $MgSO_4$ and its double salts occupy the greater part of the space model. The nitrate and Na_2SO_4 fields are very small.

H. STOERTZ

The equilibrium of the system: barium carbide, barium oxide, carbon and carbon monoxide. M. DEKAY THOMPSON. *Trans. Am. Elektrochem. Soc.* **54** (preprint), 15 pp.(1928).—The equil pressure of the reaction $BaO + 3C \rightleftharpoons BaC_2 + CO$ were measured in an Arsem vacuum furnace. This system has 3 degrees of freedom; in other words, the solid substances form a solid soln. Consistent results were obtained at 1141° and 1295°. However, at 1375° dissocn. of the carbide, or some other disturbing cause, prevented making a satisfactory series of measurements.

C. G. F.

The equilibrium in the system: magnesium oxide–magnesium chloride–water at 25° and 50°, and the constitution of magnesia cements. TUTOMU MAEDA AND SIGERU YAMANE. *Bull. Inst Phys Chem. Research* (Tokyo) 7, 340–57(1928); abst. in *Abstracts from Rikwagaku-Kenkyu-jo Iho* 1, 31-2. (In Esperanto.) Cf. *C. A.* 20, 3222.—Largely a re-publication. Besides the expts. at 50°, preliminary expts. at 25° are described which indicate the same 3 solid phases ($MgO.H_2O$, $MgCl_2.6H_2O$, and $3MgO.MgCl_2.12H_2O$). Beside the 3 cases given for cement constitution in *C. A.* 20, 3222, a 4th special case is recognized in which there is no equil. The letters *a, b, c, x, y, z, s* and *t* in the previous abst. represent g. mols. AUSTIN M. PATTERSON

The iodide, iodine, tri-iodide equilibrium and the free energy of formation of silver iodide. GRINNELL JONES AND B. B. KAPLAN. *J. Am. Chem. Soc.* 50, 1845–64 (1928).—A critical survey of sources of error in previous work is given, and a modified potentiometer described which permits detns. to 0.02 mv. in a cell having a resistance of 1.6×10^6 ohms. The potentials of a no. of I concn. cells have been measured. The soly. of I in $N/3$ KI at 25° and 0° has been detd. The equil. const. $(I^- \times I_2)/I_3 = k$ has been found to be 0.00140 at 25° and 0.00072 at 0°, the const. decreasing in solns. concd. in I as if higher polyiodides were formed. This effect has been minimized in the detn. of the free energy of formation of AgI, the results obtained showing no variation with concn. between 0.01 *N* and 0.05 *N*, and give 15,802 cals at 25° and 15,680 cals. at 0°. The free-energy change per degree is 4.8, the heat of formation 14,354 cals. Uncertainty as to the entropy of I prevents a thorough test of the third law. W. T. R.

Equilibrium in the ternary system: CrO_3–SO_3–H_2O. A. V. RAKOVSKII AND D. N. TARASENKOV. Moscow Univ. *Z. anorg. allgem. Chem.* 174, 91–6(1928).—Equil. in the system Cr_2O_3-SO_3-H_2O was measured at 0°, 20°, 40°, 75° and 100° by detg. the soly. of CrO_3 in H_2SO_4. The soly curve passes through a min. corresponding to 57.76% SO_3 in the liquid phase. The system was studied for some distance into the metastable region, however. The results are expressed diagrammatically. The hydrate $SO_3.2H_2O$ formed mixed crystals with CrO_3. This compd. decompd. in air of more than 1.7% humidity with a definite color change from yellow to red. R. L. DODGE

Osmosis of ternary liquids. III. Experimental part. F. A. H. SCHREINEMAKERS AND B. C. VAN BALEN WALTER. *Verslag Akad. Wetenschappen Amsterdam* 37, 435–43(1928); cf. *C. A.* 22, 1885.—In parts I and II, only the apparent osmosis had been considered. In this paper, the real paths of the components through the membrane are considered. A. L. HENNE

Note on temperature measurement between 20° and 70° absolute. F. HENNING. *Naturwissenschaften* 16, 617(1928).—Between $T = 20°$ and 90° abs. the Kamerlingh Onnes and Tuyn table for a Pt resistance thermometer accurate to 0.1° can be represented by $W' - W = (273 - T)[A - \{(B/(T + 10)\}]$ with *A* and *B* empirically detd. from *W* measurements at the b. ps. of H_2 and O_2 (T = 20.42 and 90.23); *W* stands for R'_t/R'_0, the ratio of resistances. B. J. C. VAN DER HOEVEN

Thermoelectric measurement of temperatures above 1500° (tungsten-graphite couple). H. L. WATSON AND H. ABRAMS. *Trans. Am. Electrochem. Soc.* 54 (preprint), 12 pp.(1928).—After a brief discussion of the standard methods of temp. measurements from 1000° to 2000° an account is given of a W graphite thermocouple, including its construction, characteristics and application. This couple has been used, with suitable protection, to over 1700° in oxidizing atms. Repeated runs to 1850° have been made in the vacuum furnace, as well as short runs to about 2400° at 1 atm pressure in reducing atms. The elements when properly selected and treated are interchangeable within 5% and an expression has been obtained for the temp. e. m. f. relation over the useful range. Automatic recording and control of furnace temp. in ceramics and steel making have been made possible by use of this couple. C. G. F.

A note on the high-low inversion of quartz and the heat capacity of low quartz at 573°. R. E. GIBSON. Geophys. Lab., Carnegie Inst. of Washington. *J. Phys. Chem.* 32, 1206–10(1928).—Although quartz usually superheats or supercools before the high-low inversion takes place, it is possible to convert low quartz reversibly to high quartz at a temp. of 572.3 ± 0.2°. This conclusion is reached from a careful study of heating and cooling curves of a solid block of Brazilian quartz. Before a block of quartz inverts from the low to the high form it usually superheats so much that the temp. does not fall to the equil. temp. during the inversion. The drop in temp. is, however, fairly const. and together with the latent heat of inversion gives the apparent heat capacity of low quartz at 573° as 4 ± 1 cal. per g. per degree. R. E. G.

The influence of pressure in the high-low inversion of quartz. R. E. GIBSON. Geophys. Lab., Carnegie Inst. of Washington. *J. Phys. Chem.* 32, 1197–205(1928).—When quartz is subjected to a uniform hydrostatic pressure of *p* megabaryes, the temp.

of its high-low inversion is raised according to the following equation: $\Delta T = -0.3 + 2.1 \times 10^{-2}p + 8.6 \times 10^{-7}p^2$. This equation expresses the results of direct exptl. observations made between 0 and 3000 megabaryes. From the initial pressure coeff. and the instantaneous vol. change during the transformation it follows that the latent heat of inversion is 3.1 cal. per g. R. E. GIBSON

Thermal conductivities of oxygen and nitrogen. HAMAR GREGORY AND SYBIL MARSHALL. Imperial College. London, England. *Proc. Roy. Soc.* (London) **A118**, 594–607(1928).—G. and M. have verified that the cond. of air should lie between O and N and should be nearer the N. Weber and Todd have also verified this but Winkleman dissents. Two systems of main and compensator tubes in gaseous connection were used. The diam. of the tubing in the 2 systems was different, thus affording a check on the supposed point at which convection vanished. Identical results should be obtained if the app. were perfect but a max. discrepancy of 0.5% was found. In the tubes was stretched a fine Pt wire. The main and compensator wire were connected, each in series with a standard 1-ohm coil, to a Callender-Griffith bridge. Each standard resistance in series with a main wire was connected to potentiometer circuit and the temp. of the wires was kept const. The O_2 was prepd. from $KMnO_4$, passed through KOH soln. and then over KOH sticks and P_2O_5. The N_2 was prepd. from $NaNO_2$, $K_2Cr_2O_7$ and Na_2SO_4, the gas was passed through chromic acid towers, then through H_2SO_4 towers and then over Cu turnings at a red heat. The abs. thermal cond. of O_2 at 0° is 5.89×10^{-5} cal. cm.$^{-1}$ sec.$^{-1}$ deg.$^{-1}$ with a temp. coeff. of 0.00289. The corresponding values for N_2 being 5.80×10^{-5} cal. cm.$^{-1}$ sec.$^{-1}$ deg.$^{-1}$ and 0.00293. S. L. B. ETHERTON

The properties of certain metal hydrides. A. SIEVERTS AND A. GOTTA. Chem Inst., Jena. *Z. anorg. allgem. Chem.* **172**, 1–31(1928).—Ce, Pr and a La-rich alloy absorbed the following amts. of H_2 at room temp. and atm. pressure, resp.: 2.79, 2.84 and 2.76 atoms per atom of metal. The ds. of the metals were 6.734, 6.514, 6.687; of the hydrides, 5.55, 5.56, 5.83; the % loss in density on hydrogenation, 17.5, 14.6, 12.8. The *heats of soln.* of 1 g. of metal in 2 *N* HCl (except the La-rich alloy in *N* HCl) were 1229, 1240, 1201 cal. for the untreated metals and 1203, 1198, 1184 for the fused metals. The *heats of formation* of 1 g. of the hydrides were 405, 381, 385 cal. The heats of formation of the hydrides per mol. H_2 contained were 42,260; 39,520; 40,090 cal. These values are close to those for the hydrides of Ba, Sr and Li. The hydrides of the alkali and alkaline earth metals, however, are denser than the corresponding metals. In this respect Ti, Zr and V are similar to Ce, Pr and La. The similarity of these latter two groups extends to the gray to black color and metal-like nature of the resp. hydrides. DAVID DAVIDSON

A method of determining the absolute zero of temperature. J. R. COTTER. *Phil Mag.* [7], **6**, 318–20(1928).—C. suggests an expt. for measuring the quantities occurring in Clapeyron's equation and proposes to use them to measure the thermodynamic scale of temp. and to det. zero abs. GEORGE GLOCKLER

The theory of heats of fusion. N. RASHEOSKY. Westinghouse Research Lab. *Phys. Rev.* **29**, 220(1927).—By plotting the potential energy, ϕ, of an aggregation of atoms *vs.* the at. distance, δ, a curve is obtained having a min. at $\delta = \delta_0$ (δ_0 = space lattice const. at 0 abs.) and tending asymptotically to zero for $\delta = \alpha$. At these points $d\theta/d\delta = 0$. Between them, at some point δ_1, $d^2\phi/d^2\delta = 0$. As long as $\delta < \delta_1$ the deformation of the body causes a force to appear, which tends to restore the initial state, and which increases with increasing deformation. For $\delta > \delta_1$ the restoring force diminishes with increasing deformation. Hence there is no question even about an approx. behavior of the body as an elastic one. This leads to the assumption, that when by thermal agitation the space-lattice const. reaches the value δ_1, the body becomes liquid. The amt. of work necessary to increase δ from δ_0 to δ_1 is thus interpreted as the total heat of fusion. By using for ϕ the expression $\phi = A/\delta^3 - B/\delta^n$ and calcg. A, B and n from the compressibility and thermoelastic consts. of Gruneisen, the heats of fusion of 7 metals were calcd. and found in fair agreement with the exptl. results. R. L. H.

The specific heat of solid substances. v. JÜPTNER. *Feuerungstech.* **16**, 97–102 (1928).—In the formulas for the sp. heats of solids by Einstein, Nernst, Debye and the author appears a quantity $\beta\nu$, which is the product of the natural frequency of the atom by a universal const. This paper discusses its variations with temp., as detd by applying the formulas to exptl. data. Though the formulas are based on the sp heats at const. vol., those at const. pressure may be used for this purpose without much error. As a rule, $\beta\nu$ increases with temp. to a max. and then falls off. The abs. temp at which this max. occurs is a much larger fraction of the m. p. with cubic and hexagonal lattices than with others. Where elements have several crystal forms $\beta\nu$ is largest

when the at. distance is greatest. For elements of the same lattice type, the temp. at which $\beta\nu$ attains half its max. value falls off with increasing at. wt. E. W. T.

The specific heats at low temperatures of manganous oxide, manganous-manganic oxide and manganese dioxide. RUSSELL W. MILLAR. *J. Am. Chem. Soc.* **50**, 1875–83 (1928).—By the method originated in Nernst's laboratory these specific heats have been measured from 70° to 300° K. With the aid of the third law of thermodynamics and the data of previous investigations values are computed which are summarized as follows:

Substance	Mn	O_2	MnO	Mn_3O_4	MnO_2
S_{298}	7.3	49.2	14.92	35.73	13.93

Reaction	ΔH	ΔS	ΔF
$Mn + 1/2O_2$	− 90,900	−17.0	− 85,830
$3Mn + 2O_2$	−328,000	−84.6	−302,800
$Mn + O_2$	−125,300	−42.6	−112,600

W. T. RICHARDS

Advances in the field of thermochemistry. W. A. ROTH. *Z. angew. Chem.* **41**, 397–401(1928). E. H.

Theory of the specific heat of methane. JAKOB KUNZ. Univ. of Ill. *Phys. Rev.* **29**, 220(1927).—The results of Dennison's analysis of the oscillations of CH_4, based on the infra-red absorption bands, and the quantum theory of radiation are used for the theoretical detn. of the sp. heat of CH_4. The theoretical values are a little higher than the exptl. (plotted *vs.* temp.) R. L. HERSHEY

Thermodynamic aspects of the constitution of compounds of tervalent and multivalent elements. GOTTFRIED BECK. Univ. Zurich. *Z. anorg. allgem. Chem.* **174**, 31–41(1928).—The application of the logarithmic contraction equation $kQ = 546(\log V_a - \log V_c)$ where Q = heat of formation, to compds. of tervalent and multivalent elements is studied, particularly the role of the reaction const. k as a function of electron configuration and its significance for the quantum mech. explanation of certain chem. processes. Values of k are given in a table for the halides, oxides, sulfides and sulfates of various metals. The normal value for the halides is found to vary from 0.57 to 0.60, and with this value the most stable complex formation is of the type $Me'_3Z^{III}X_6$, having the coördination no. of 6. The only exception to this is VCl_3, which forms the compd. $KVCl_4$. The higher values of k obtained for the Bi halides and $FeCl_3$ (0.8 − 0.9) indicate a different mol. structure, the normal type of complex here being $Me'_2Z^{III}X_5$. For Sb and Bi fluorides the normal form is $Me'Z^{III}F_4$. The extreme values of k obtained for the iodides of Sb and As (1.61 and 3.08) indicate that here with a corresponding contraction a smaller quantity of energy is liberated. This is explained as due to the rotation of the valence electrons on a widely extended orbit with a low energy level. For the rare earth halides values of k are about 0.44, indicating a more closely confined orbit for the valence electrons. The oxides in general agree very closely with the chlorides. For the sulfates the group Al, Fe, Cr, In with k about 0.30 form alums; the group Tl, Sb, Bi, Mn with k 0.55 to 0.62 are in general quantitatively hydrolyzed; the rare earths with k about 0.12 probably have a different ion lattice. The relation between electron configuration, chem. behavior and values obtained for k is discussed for many of these compds. It is shown that the sulfates of Th and U on the one hand and Zr and Ce on the other hand are thermodynamically equiv. and therefore show similar complex salts. Density detns. and measurement of the heat of formation of some of these compds. are made. In the case of the sulfates the reaction is between oxide and SO_3 and in the case of the halide between metal and halogen. Q in kg.-cals. is given as follows: $Tl_2(SO_4)_3$ 105, $Mn_2(SO_4)_3$ 85, $Sb_2(SO_4)_3$ 79.1, $Bi_2(SO_4)_3$ 102, $Sn(SO_4)_2$ 46.5, $Zn(SO_4)_2$ 104, $Ce(SO_4)_2$ 103.5, $Th(SO_4)_2$ 115.5, $U(SO_4)_2$ 78, $UO_2(SO_4)_2$ 50, $ZrCl_4$ 142, $TeBr_4$ 57, LaF_3 402. H. STOERTZ

Entropy of dilute solutions. A. LANDÉ. *Z. anorg. allgem. Chem.* **171**, 143–5 (1928).—Theoretical. L. gives a new derivation of Planck's formula. H. S. v. K.

Tribo-electricity and friction. II. Glass and solid elements. P. E. SHAW AND C. S. JEX. *Proc. Roy. Soc.* (London) **A118**, 97–108(1928); cf. *Ibid* **A111**, 339.—By means of an arrangement designed to give const. conditions of pressure and surface, measurements have been made of the sign and amt. of charge acquired when glass rods and various solid elements are rubbed together. The elements tested were of a high degree of purity, special attention being paid to surface cleanliness. The glass cleaned by boiling in chromic or nitric acid, followed by exhaustive treatment with boiling water. The following elements never, with any type of glass surface tried, give neg. charge: C, Cd, Fe, Pb, Bi, Ag, Cu, Au, Pt, Mg, W. The elements Zn, Sn, Al,

Sb, Ni, Co, Se, Te, As, Cr, Th and S acquire an ultimate neg. charge. The initial pos. charge shown is attributed to the slight acid effect residual on the glass. In the few cases tested, rubbing in a vacuum gives the same result as in the open air. Little difference in degree is found, and none in sign, between the behavior of soda and lead glass. Evidence is given of the predominating influence on the charging of residual acid, alkali or water films on the glass. Hg, tested in a vacuum by a special method, shows pos. charges, but becomes neg. if air is introduced. Various theories of frictional electricity are discussed, and an attempt is made to apportion to each recognized source of charge its own weight in the various expts. III. **Solid elements and textiles.** *Ibid* 108–13.—The textiles tested were specially purified silk, cotton and filter-paper. The arrangement of the different elements, according as they charge textiles and glass, is found to correspond closely with their chem. qualities. It is impossible to devise a simple tribo-elec. series of one column to include all solids, for it is found that of 3 solids (A, B, C) A may be pos. to B, B to C, and yet C be positive to A. Anomalies are found with the strongly electro-pos. metals Al, Mg, Cr, Ni, Co, Zn and Sn, which appear in 2 places in the tribo-electric series. B. C. A.

The supraconductive state of gray tin. W. J de Haas, G. J. Sizoo and J. Voogd. *Proc. Acad. Sci. Amsterdam* **31**, 350–2(1928).—See *C. A.* **22**, 1880. E. H.

Contact electricity, thermoelectricity and cohesion pressure. R. von Dallwitz-Wegner. *Z. Elektrochem.* **34**, 42–9(1928).—Values of the cohesion pressure, K, of various substances at 0° and 100° are calculated from the relation, $K = 84.1\, d\, [(1 + at)/a]/M$, where d = density, M = mol. wt., t = temp. and a = coeff. of cubical expansion. For solids the values of K range from 13×10^6 for diamond to 56.5×10^3 for Pb at 0°, the sequence of the various substances corresponding with the order of hardness. For Hg at 0°, $K = 31 \times 10^3$. The relation of the cohesion pressure to contact electricity and thermo-electricity is discussed, and an equation is developed whereby the e. m. f. of a thermo-element with a temp. difference of 100° between the hot and cold junctions can be calcd. from the cohesion pressure data. For a Pt-Ag element satisfactory agreement is obtained with the observed value, but for many thermo-elements there are notable discrepancies. These discrepancies are attributed to the fact that small quantities of impurities in the metals can have a large effect on the e. m. f. and on K, so that agreement can be expected only if K is detd. for the particular samples of metal used in the thermo-element. B. C. A.

Valency of chromium in its deposition from aqueous solutions of chromic acid. E. Liebreich. *Z. Elektrochem.* **34**, 41–2(1928).—Whereas the data obtained by Shcherbakov and Essin (*C. A.* **21**, 3163) for current efficiencies in the electrolysis of chromic acid solns. contg. a high concn. of H_2SO_4 correspond with the formation of Cr by discharge of chromic ions, the data for solns. weaker in H_2SO_4 are in better agreement with the view that the metal is formed by discharge of chromous ions. B. C. A.

Cathodic overvoltage. E. Liebreich and W. Wiederholt. *Z. Elektrochem.* **34**, 28–41(1928).—In continuation of previous work (*C. A.* **18**, 3525; **20**, 141), the course of current-potential curves has been detd. for the cathodic and anodic polarization of electrodes of Cu, Ag, Au, Pt, Pd, graphite and amorphous C in 0.02 N H_2SO_4 and for Cu and Ag electrodes in 0.02 N NaOH. With increasing cathodic polarization, all the metals exhibit an "activation period" before H evolution begins. During this period, the metal becomes coated with a thin film of hydroxide or basic salt which hinders the evolution of H, either mechanically or by consuming it in reduction processes. The H overvoltage of the metals is regarded as being essentially detd. by this film formation. The formation of the film itself is attributed to the reaction of the metal with the OH ions liberated in its immediate neighborhood by the initial discharge of H ions to form H which is occluded in or adsorbed by the metal. Amorphous C exhibits no activation period and graphite scarcely any. In these cases the H overvoltage is attributed to the formation of gaseous hydrocarbons and the occlusion of these gases and of H in the electrode. It is suggested that the H overvoltage of metals is intimately connected with their capacity for becoming coated with a more or less adherent film of the type which is associated with passivity phenomena. B. C. A.

Determination of dipolar moments from critical values of physical properties. Ya K. Suirkin. Polytechnic Inst., Ivanova Vosnessensk. *Z. anorg. allgem. Chem.* **174**, 47–56(1928).—The following expression for elec. dipolar moments is derived: $m = 1.66 \times 10^{-20}\, T_{cr}/\sqrt{P_{cr}}$, in which T is the crit. temp. and P the crit. pressure. By this formula, m is calcd. for 79 different substances, some of the results being as follows: $m.10^{11}$ being given: Cl_2 0.79, O_2 0.36, N_2 0.36, O_3 0.54, CO 0.38, CO_2 0.59, CS_2 1.06, SO_2 0.82, SO_3 0.89, NO 0.37, NO_2 0.72, HCl 0.60, H_2O 0.73, H_2S 0.66, NH_3 0.64,

PH, 0.67, CH_3Cl 0.85, $CHCl_3$ 1.21, C_2H_5Cl 1.03, C_3H_7Cl 1.24, C_6H_5Cl 1.57, $(C_2H_5)_2O$ 1.30, CH_3OH 0.96, C_2H_5OH 1.08, C_3H_7OH 1.26, $C_6H_5CH_3$ 1.53, C_2H_4 0.65, $C_2H_5NH_2$ 1.02, $C_3H_7NH_2$ 1.21, $(CH_3)_3N$ 1.08, CH_3COOH 1.05, C_3H_7COOH 1.41. In a homologous series of org. compds., *m* increases in a regular manner as each CH_2 group is added, the amt. of increase becoming smaller as the no. of CH_2 groups in the mol. rises. Beginning with 0.19 the increase falls to 0.11 as CH_2 groups are added to the series commencing with CH_3COOH. Additive properties of the dipolar moments are indicated in reactions where the initial as well as the final substances are typically dipolar, the sum of the moments on each side of the equation being approx. equal. H. Stoertz

The electrolytic behavior of thin films. I. Hydrogen. F. P. Bowden and E. K. Rideal. *Proc. Roy. Soc.* (London) **A120**, 59–80(1928).—The beginning of a series of expts. to find out how the potential of an electrode varies as the first few layers of atoms are deposited. H is studied first. The potential changes were measured to 0.01 sec. by recording the fluctuations of a strong galvanometer on a moving photographic film. O_2 had to be carefully excluded as its presence affects the apparent rate of growth and decay of the active H surface markedly. B. and R. find the following equation valid, $-E = \beta\Gamma + \text{const.}$, where E is the electrode potential, Γ is the true surface concn. of active H on the cathode surface, and β is a const., the same for all metals forming the cathode. The cathodic potential for all metals is raised 100 milli-v. by 0.0003 of an at. layer of H. The rate of decay of the active surface is give by the equation $-d\Gamma/dt = k_1 e^{-k_2E}$. B. and R. think the potential due to the presence of an elec. doublet (elec. moment, $\mu = 7.2 \times 10^{-18}$ e. s. u.) composed of a proton and a negative H ion sepd. by the distance 1.5×10^{-8} cm. **II. The areas of catalytically active surfaces.** *Ibid* 80–9.—The catalytic activity and the surface area under different conditions of annealing, rolling, activation and electroplating for C, Ag, Pt and Ni are studied. The area of Pt black may be 2000 times its apparent area, that of sand-papered metal 10 times, and that of Ni activated by alternate oxidation and reduction 5 times. Rolling reduces the accessible area. The sp. activity for the deposition of H differs widely among the metals, but it is not affected much by chem. or thermal treatment. Sand papering or rolling increases the activity, which gradually diminishes with aging of the cathode. Malcolm Dole

Theory of cell with liquid junction. Paul B. Taylor. Univ. of Penn. *Phys. Rev.* **29**, 369(1927).—In deriving an integral for the e. m. f. of a cell with liquid junction in terms of transference nos and mol. free energies, the transference nos. are made to depend on solving a set of differential equations for the interdiffusion of two electrolytes. Ionic mobilities and mol. free energies are involved in the equations. Ionic free energies are not involved. L. D. R.

An electronic theory of passivity. William D. Lansing. Univ. of Ill. *Phys. Rev.* **29**, 216–7(1927).—Under normal conditions the electrons of Fe are probably distributed among the energy levels as 2, 8, 14, 2. Under strong oxidizing conditions this may become 2, 8, 8, 8, a structure analogous to Kr, and thus becomes passive and non-magnetic. Thin films of Fe produced by a method of cathode sputtering were passive. The magnetic measurements are not complete. The electrode potential of ordinary Fe in 0.5 molal $FeSO_4$ was +0.365 with respect to the H electrode; the corresponding value for passive Fe was −0.508 Thermodynamically, passive Fe is the more stable, with a free-energy change of 35,700 cal. The electrode potential of sputtered Fe in this soln. ranged from 0.035 v. to −0.065 v. becoming more noble with time. This is explained by the supposition that the film is still too thick to be passive and non-magnetic all the way through. R. L. H.

The electronic theory of valency. VI. The molecular structure of strong and weak electrolytes (*b*) reversible ionization. T. Martin Lowry. *Phil. Mag.* [7], **6**, 50–63(1928).—See *C. A.* **22**, 724. George Glockler

The dielectric polarization of liquids. III. The polarization of the isomers of heptane. C. P. Smyth and W. N. Stoops. *J. Am. Chem. Soc.* **50**, 1883–90(1928); cf. *C. A.* **22**, 3572.—The dielec. consts., ds., ns, dispersions and viscosities of the isomers of heptane and 2,2,4-trimethylpentane have been measured. From the ds. and dielec. consts. over the entire range where these are liquid no elec. moment is found. Conclusion: The atoms in a satd. hydrocarbon mol. may be joined together in every possible configuration without giving rise to any measurable lack of elec. symmetry, although very small differences in the rigidity of binding of the electrons are detected. W. T. Richards

Principal susceptibilities of manganese ammonium sulfate crystals at low temperatures. L. C. Jackson and W. J. de Haas. *Proc. Acad. Sci. Amsterdam* **31**, 346–9(1928).—See *C. A.* **22**, 1528. E. H.

Magnetic susceptibility of single-crystal elements. C. Nusbaum. Case School of Applied Sci. *Phys. Rev.* **29**, 370(1927).—By means of a modified Terry torsion balance the magnetic susceptibility of Te has been detd. Single crystals of Cd, Bi, Sb, Sn and Zn are being similarly studied. L. D. R.

Magnetic susceptibility of single-crystal metals. C. Nusbaum. Case School of Applied Sci. *Phys. Rev.* **29**, 905(1927).—The mass susceptibility for Bi has been found to be 1.13 $\times$ 16^{-6} parallel to the principal axis and 1.32 $\times$ 10^{-6} dyne cm. in a perpendicular direction. Resp. values for Sb are 0.497 $\times$ 10^{-6} and 1.38 $\times$ 10^{-6}. L. D. R.

Magnetic studies on salts, with particular reference to those with complex ions. Lars A. Welo. Rockefeller Inst. for Medical Research. *Phil. Mag.* [7], **6**, 481–509 (1928).—The salts, 124 in number, studied are of the following groups: Polynuclear salts of Fe and Cr having very large negative values of Θ in the Curie-Weiss law $K_\alpha (T - \Theta) = C$. T = abs. temp. K_α, Θ, C are const. Fe salts having irregular and variable moments within the observed range of temps. Miscellaneous salts of Fe and Cr of normal ionic moment and with relatively small values of Θ in the Curie-Weiss law. Coordination compds. of Cr and Co. Ferricyanide, pentacyano derivatives and Prussian blues. Salts showing an anomalous temp. variation of the susceptibilities. Diamagnetic and near diamagnetic salts of some transition elements. George Glockler

Magnetic susceptibility of rare-earth metals. E. H. Williams. Univ. of Ill. *Phys. Rev.* **29**, 218(1927).—The magnetic susceptibilities of Ce, La, Pr and Yt have been detd. In each case the value of the susceptibility depends upon the intensity of the magnetic field, decreasing as the field is increased from 10 to 4000 gausses. In this respect the magnetic susceptibility of the rare earth metals resembles the behavior of the permeability of Fe. Because of the low value of the susceptibilities, 20 $\times$ 15^{-6} to 50 $\times$ 10^{-6} dyne cm. per g., for the fields used, it is impossible with the methods available to fill in the gap for fields between 10 gausses and zero. This gap is the most interesting part of the curve. R. L. Hershey

Subjective influences in colorimetric work, and their elimination. J. Eisenbrand. *Pharm. Ztg.* **73**, 909(1928).—A discussion of certain characteristic cases with suggestions for eliminating possible disturbing factors by means of suitable light filters. W. O. E.

Selenium cells as colorimeters. A. Mickwitz. *Z. anorg. allgem. Chem.* **171**, 285–311 (1928).—In order to study the absorption of light by a soln. the effect of the transmitted light on the resistance of a Se cell, measured by the current passing when a const. p. d. is applied, may be compared with the effect obtained by using as absorbent a layer of water of the same thickness, and the same source of light. In order to eliminate the effect of variations in the properties of the cell with the time and also hysteresis effects in the resistance, the cell is exposed to the light transmitted by the water and the light transmitted by the soln. for alternate periods of 20 sec. each, each period of illumination being sepd. from the following period by 40 sec. of darkness, and this is continued until the current corresponding with each kind of light becomes constant. The absorption by the soln. is then expressed numerically by the ratio x of the quantity (current passing through the cell when illuminated by the light transmitted by the soln.—current passing in darkness) to the corresponding quantity for the water. Absorption curves constructed in this way for solns. of $CuSO_4$ and $Cu(NO_3)_2$ may be used for the colorimetric detn. of these salts, the mean error with the sulfate being $\pm$ 1.5%. As the value of x is affected considerably by variations in the p. d. applied to the cell, this should be kept const. for all the measurements. Iron may be detd. colorimetrically in the form of colloidal FeS, the oxidation of which with consequent change of color, is delayed by addn. of Na_2SO_3, the mean error is $\pm$ 2.5%. Expts. of this kind show that a satd. soln. of FeS at the ordinary temp. contains 0.0028 g. of iron per l. B. C. A.

Reproducible liquid filters for the determination of the color temperatures of incandescent lamps. Raymond Davis and K. S. Gibson. Bur. of Standards. *Phys. Rev.* **29**, 916(1927).—A series of filters, reproducible from specification, has been worked out whereby any Planckian energy distribution between 2300° and 4000° K. may be converted to the color of mean Washington sunlight, thus permitting exact calibration of a lamp by photometric measurements. The specifications of the filter solns. are not given. W. W. Stifler

Hydrogen. VII. Density, refractivity and absorption of light of concentrated aqueous solutions of hydrogen halides. G. F. Hüttig and H. Kükenthal. *Z. Elektrochem.* **34**, 14–8(1928); cf. *C. A.* **22**, 360.—In continuation of similar work on solns. of Li halides (*C. A.* **20**, 699), ds. and refractivities of solns. of HCl and HBr at various concns. have been detd. and coeffs. of extinction for HCl solns. measured in

the region λ2300–2800.* Further data for the ds., mol. contractions and refractivities of solns. of Li halides are also recorded. B. C. A.

Electrical and luminous effects produced by rolling mercury on glass in a vacuum. M. DUFFIEUX. *J. phys. radium* [vi], **9**, 61–70(1928).—The effects produced by rolling Hg in an evacuated flask have been studied. A current is found to be set up between the Hg as pos. pole and the glass as neg. pole. At temps. below 100° the discharge caused by this current emits the arc spectrum of Hg, but above 100° a phosphorescent vapor above the liquid emits the continuous spectrum of Hg. The mechanism of the electrification is discussed. It is found that the elec. layer which attracts the liquid is on the glass. B. C. A.

Disappearance and reversal of the Kerr effect. C. V. RAMAN AND S. C. SIRKAR. *Nature* **121**, 794(1928).—Observations on the Kerr effect with octyl alc. confirm Raman and Krishnan's theory of elec. birefringence in liquids (cf. *C. A.* **21**, 2419). B. C. A.

Polarization of λ 2537 of mercury. H. F. OLSON. *Phys. Rev.* **29**, 207(1927).—1 S-2p_2 of Hg excited by plane polarized light shows 79% polarization both in the absence of any magnetic field and in the presence of a field parallel to the elec. vector in agreement with the results of Keussler. That such a field should produce no change in polarization is in accord with Heisenberg's extension of the principle of spectroscopic stability. That the polarization is not complete might be interpreted as due to collisions but more probably is due to the fact that in very weak fields some of the fine components of 2537 have not the same Zeeman effect as in strong fields. The polarization with other relative orientations of field and light vector and the variation of polarization with field intensity in weak fields may be successfully interpreted by means of a semi-classical model, with proper relative intensities parallel and perpendicular to the light vector, rotating after excitation with an angular velocity $^1/_2\ g\ (e/m)\ (H/c)$ and emitting a damped wave. From curves connecting depolarization, rotation of max. of polarization, etc., with field intensity K has been found to be $1.02(\pm.02)10^7$ sec.$^{-1}$. R. L. H.

Statistical series of the Charlier *A* type and Boltzmann' equation. U. WEGNER. *Z. Physik* **45**, 539–47(1927).—Mathematical. H. G.

Ethylene glycol as an atmometer reagent to measure the evaporating environment at temperatures below freezing. A. L. BAKKE AND J. M. AIKMAN. Iowa State College. *Science* **68**, 162–4(1928).—Since app. for measuring the humidity of the atm., which depends on the evapn. of H_2O, is not suitable below the f. p. when H_2O itself is used, the authors suggest the substitution of a soln. of ethylene glycol of known concn., which may be detd. from the sp. gr. A 20% soln. is suitable for temps. down to 15° F. A chart is presented giving the correction factor, which is worked out by detn. of the relative rates of evapn. of the soln. and pure water at an unstated temp. Specifically, the atmometer of the standardized cylindrical type provided with a Livingston-Thone valve was used in these expts. The actual loss in wt. from a soln. multiplied by the proper correction factor then gives the wt. of pure H_2O which would have been evapd. under the same conditions. A. W. KENNEY

The stability of colloidal $Fe_3(PO_4)_2$ prepared with gelatin or blood serum (MESSINI) 11A. An electrophoresis cell (MOONEY) 1. Heusler's alloys. System Mn-Al-Cu (HEUSLER) 9.

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3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

S. C. LIND

Metastable neon and argon. RICHARD RUDY. Research Lab. Nela Park. *Phys. Rev.* **29**, 359-60(1927).—Absorption of 6402 increased with lowering of pressure from 8 mm. downward and beyond the min. discharge potential. The volt-ampere characteristic was not changed by this absorption. Strong absorption was found in the negative glow. L. D. R.

Explanation of the long life of metastable atoms. G. BREIT. Carnegie Inst. of Wash. *Phys. Rev.* **29**, 361(1927).—Schrödinger's idea of radiation if $q(nm) = 0$ is first given. By estg. the life of an atom on the basis that radiation may exist in $q(nm) = 0$ corresponding to a coil aerial in radio for which the doublet also vanishes, it is found to be about a sec. L. D. R.

Determination of e/m. F. H. LORING. *Chem. News* **136**, 145-7, 161-5(1928).—The value selected from the work of European physicists is $e/m_0 = 1.7674 \times 10^7$ in e. m. c. g. s units. American physicists, according to L.'s method of averaging, find 1.7660×10^7. The grand av accepted by L. is 1.767×10^7. W. T. RICHARDS

Wave mechanics of atomic lattices. M. J. O. STRUTT. *Ann. Physik* **86**, 319-24 (1928).—The motion of electrons in 1-, 2- and 3-dimensional cryst. lattices has been considered mathematically from the standpoint of wave mechanics. A. J. KING

King's classical theory of atomic structure. BORIS PODOLSKY. Calif. Inst. Tech. *Phys. Rev.* **29**, 750(1927).—In his paper, "A Classical Theory of Atomic Structure and Radiation" (Mercury Press, Montreal), King assumes all electrons spinning with the same angular velocity. The electron in motion suffers a Lorentz-Fitzgerald contraction which is supposed to cause precession. He obtains a picture of the quantum mechanism by assuming the frequency of precession to equal the frequency of incident radiation in the case of photoelec. phenomena and to an integral multiple of the orbital frequency in the case of radiation P shows the electron could not have a precession, that it could not have a precession and absorb energy without changing the frequency of precession and that as the precession of the electron, due to causes other than those discussed by K., has found its place in explaining normal doublets and triplets, *i. e.*, small changes in frequency and not the whole effect, K.'s picture is undesirable. S. L. B. ETHERTON

Atomic mechanics. ALBERTO E. SAGASTUME BERRA AND RAFAEL GRINFELD. *Anales soc. cient. Argentina* **105**, 11-42(1928).—From the principle of d'Alembert, *i. e.*, "in the movement of a system, the forces applied at each point and the forces of inertia are in equil at each instant," the general results of Lagrange, Hamilton and Jacobi for the motion of a system are then derived in 56 equations. There follows a theorem of Larmor which may be stated and proved. Thence, with the help of quantum hypotheses, the normal Zeeman effect may be explained. Finally the method of Lagrange and Jacobi is applied to the movement of an electron subject to the action of an elec. nucleus and under the influence of an elec. field. S. L. B. ETHERTON

• **Wave mechanics of an atom with a non-coulomb central field. III. Term values and intensities in series in optical spectra.** D. R. HARTREE. Christ College. *Proc. Cambridge Phil. Soc.* **24**, Pt. 3, 426-37(1928).—Continuing the method of *C. A.* **22**, 1269, an expansion valid near the origin is found for the wave soln. of the wave equation in a Coulomb field for terms of non-integral quantum no. n. This allows a calcn of the quantum defect. The soln is of the form $G \cos \pi n + H \sin \pi n$, where for a given radius G and H are even functions of $1/n$. The extended Ritz formula follows. The law $I/\nu^4 \alpha 1/n^3$ for the variation of intensity in a series with effective quantum no. of the variable term is also derived from this result. F. R. BICHOWSKY

The classical reasonableness of the quantum theory and simple operative solutions of Schrödinger's equation. A. PRESS. *Phil. Mag.* [7], **6**, 33-49(1928).—Mathematical. GEORGE GLOCKLER

Heisenberg's indetermination principle. E. H. KENNARD. *Phys. Rev.* (ii) **31**, 344-8(1928).—The principle is applied to cases where the position and velocity of an electron are observed by allowing it to pass through shutters opened momentarily at known times B. C. A.

Physicochemical considerations in astrophysics. W. NERNST. *J. Franklin Inst.* **206**, 135-42(1928).—The large amts. of energy radiated by the sun may be due to the decompn. of radioactive elements of higher at. wt. than U. G. CALINGAERT

A suggested method for extending microscopic resolution into the ultra-microscopic region. E. H. SYNGE. *Phil. Mag.* [7], **6**, 356-62(1928).—A biological section ground

over a small surface to a plane (true to 10^{-6} cm.) moves over an aperture (diam. 10^{-6} cm.) illuminated from below. The light intensity is varied because of the different opacities of various sections of the specimen. A photoelec. cell is illuminated by the small light beam and a picture is produced as in telephotography. GEORGE GLOCKLER

Recent progress in the investigation of the elements and isotopes. OTTO HAHN. *Z. angew. Chem.* **41**, 516–23(1928). E. H.

The magnetic susceptibilities of electronic isomers. S. S. BHATNAGAR AND R. N. MATHUR. *Phil. Mag.* [7], **6**, 217–23(1928).—The const. *K* contained in the expression for diamagnetic susceptibility (cf. *C. A.* **22**, 2105) increases with the no. of atoms in the mol. It is const. for isomeric mols. For groups of isomers having the same no. of atoms in the mol., the values of *K* increase with the at. nos. of the groups. G. G.

The structure of matter. I. Hydrogen and oxygen. OTTO REINMUTH. *J. Chem. Education* **5**, 1152–63(1928).—Review. E. H.

The building stones of the atomic nuclei. STEFAN MEYER. Inst. Radiumforschung, Wien. *Scientia* **44**, 89–98(1928).—A review of the established facts regarding atomic nuclei. MARIE FARNSWORTH

System of structure for atomic nuclei. WARREN W. NICHOLAS. Cornell Univ. *Phys. Rev.* **29**, 612–3.—With the proton inside the electron (neutron structure) the "packing" effect may be explained. The evolution of light elements was from complex to simple, nuclei losing units smaller than the α-particle. With the protons and neutrons on alternate cubic corners in a cubic lattice, features are shown possessed by known nuclear series. A structure for the nucleus of S 32 is proposed which accounts for known isotopes from S 32 to He 4. S. L. B. ETHERTON

A measurement of radiation at about 5μ. KING E. GOULD. *J. Optical Soc. Am.* **17**, 198–206(1928). E. H.

Experiments on highly penetrating radiations from the earth. L. N. BOGOIAVLENSKY AND A. H. LOMAKIN. U. S. Bur. of Mines, *Information Circ.* No. **6072**, 1–13 (1928).—A contour map of the region of Pyatygorsk in the Caucasus showing the radioactivity of various points is drawn. By using Pb screens the hardness of the rays is detd. In several places near the surface the radium content of the deposit is 5×10^{-10} g per g. The radiations have been found to be quite const. The upper layer has little influence on penetrating radiation. L. D. R.

The amount of radon in the atmosphere according to measurements during airplane flights. A. WIGAND AND F. WENK. *Ann. Physik* **86**, 657–86(1928).—The purpose of the research was to answer the question of the vertical distribution of Rn in the atm. and its origin by direct measurement of the Rn content on airplane flights. After expts. with C adsorption, the method of condensing Rn with liquid O_2 was found to be the best adapted. The app. permitted 3 measurements of 3–7 min. duration for each flight. For 5 flights up to a height of 3800 m., the value found showed in general a strong decrease in Rn content with increasing height, decreasing to a very small value. The change of the Rn content with height was detd. by the origin and previous history of the air in the various layers. The measurements demonstrate the sole origin of the Rn of the atm. from the surface of the earth and show that the vertical distribution results only from the interchange of air. MARIE FARNSWORTH

Radiometric exploration of oil deposits. L. N. BOGOIAVLENSKY. U. S. Bur. of Mines, *Information Circ.* No. **6072**, 13–8(1928).—Penetrating radiation changes sharply between places a few m. apart. Measurements continued over a period of 3 years showed no variation in intensity at the various points. Intensity depends on concn. of radioactive elements in the earth's core. Oil possesses a high absorbing power for radioactivity. The colloidal materials underlying oil beds are richer in radium on account of absorbing power of colloids. L. D. R.

Some measurements of the radioactivity of the gases and water of the Ukhta oil-bearing region and of medicinal mud and brine from the salt lake of the Tinakee Station. A. CHEREPENIKOV. U. S. Bur. of Mines, *Information Circ.* No. **6072**, 18–20(1928).—Radioactivity was found in the gas from the Government's "crevice" N° on the Ukhta River. L. D. R.

Supplementary information on radioactive substances and methods for determining their location. F. W. LEE. U. S. Bur. of Mines, *Information Circ.* No. **6072**, 20–7(1928).—This article contains a discussion of the usual way of detg. radioactivity. L. D. R.

Multiple positively charged radioactive ions. LEONARD B. LOEB. *Science* **67**, 468–70(1928).—Recoil atoms from active deposits of Ra, Th and Ac appear to be multiply charged. The charge may be greater than three. Reasons supporting this affirmation and a method of investigating it are presented. W. T. RICHARDS

A suggested theory of electric conduction. W. H. McCrea. Trinity College, Cambridge. *Proc. Cambridge Phil. Soc.* **24**, Pt. 3, 438-44(1928).—According to the wave mechanics an electron in the neighborhood of two nuclei has a finite probability of shift from a quantum state belonging to one to a quantum state belonging to the other. This probability of shift is suggested as the mechanism of elec. conduction. The theory is not worked out completely, but a calcn. from the case of two nuclei gives conductivities of the right order. Qualitatively the theory looks promising.
F. R. Bichowsky

A new method of determination of the volume of one curie of radon. L. Wertenstein. Free University, Warsaw. *Phil. Mag.* [7], **6**, 17-33(1928).—The method described consists in measuring simultaneously the pressure and the coeff. of (external) friction of the gas. This coeff. is proportional in a highly rarefied, chem. pure gas to its pressure and to the square root of its mol. wt.; in a mixt. of gases to the sum of the products of the pressure and the sq. root of the mol. wt. of each constituent. The pressure was detd. by means of a calibrated Knudsen gage and the coeff. of friction by means of a quartz-fiber gage. The "damping," indicated by this gage as the inverse of the time during which the amplitude of the oscillations of the quartz fiber diminishes in a given ratio, is proportional to the coeff. of friction. CO_2 was the other gas used. The vol. of 1 curie of Rn is 6.39×10^{-4} cc. at normal pressure and temp. G. G.

A quartz-fiber electrometer. D. R. Barber. Univ. Coll. of the South-West of England, Exeter. *Phil. Mag.* [7], **6**, 458-65(1928).—A description is given of a double-plate electrometer employing a single suspended quartz fiber as the moving system. A method of rendering the quartz conducting by cathode sputtering of Ag is given, with a description of the technic developed in handling and mounting the fibers. The results of a direct calibration of the instrument are given, and compared with those obtained by other investigators using different types of electrometers. G. G.

The motion of a particle in a periodic field of force. S. L. Malurkar, Sidney Sussex College, and J. Hargreaves, Clare College, Cambridge. *Proc. Cambridge Phil. Soc.* **24**, Pt. 3, 447-50(1928).—The motion of a wave mechanics electron in a field of force which varies as the cosine of distance is as in the classical case excepting for terms corresponding to the Heisenberg uncertainty relation. F. R. Bichowsky

Wave equations of the electron. C. G. Darwin. *Proc. Roy. Soc.* (London) **A118**, 654-80(1928).—A mathematical paper. Dirac's work (*C. A.* **22**, 1535) is discussed by methods of differential equations instead of the noncommutative algebra used by D. The emission of radiation from an atom contg. D.'s "spinning electron" is discussed. The equations solved for the motion of an electron in a central field of force may be expressed in terms of spherical harmonics and lead to a doublet structure for the spectrum. The rule of combination is considered and the Zeeman effect is worked out. S. L. B. Etherton

Pseudo photographic effect of slow electrons. Jos. E. Henderson. Yale Univ. *Phys. Rev.* **29**, 360(1927).—With a magnetic spectrograph photographic plates subjected to a beam of slowly moving electrons showed a dark line at the position calcd. from the consts. of the app. 500-v. electrons discolored glass, quartz, calcite, Pt, Cu, Ni, Ag, Al, Zn, Pb and brass. The nature of the discoloration depends on the material.
L. D. R.

The electron in a gravitational field. J. M. Whittaker. Trinity College, Cambridge. *Proc. Cambridge Phil. Soc.* **24**, Pt. 3, 414-20(1928).—On the assumption of the ordinary gravitational equations the charge of the pos. nucleus of a H atom (wave mechanics model) should be $e(1 - \alpha/4a)$, where α and a are the relativity consts. This gives a displacement to the red of the H lines equal to that predicted on the relativity theory. If the gravitational theory of de Sitter is assumed, electrostatic potentials are everywhere modified as if the dielec. const. of space were $(1 - \mu r^2)^{-1}$. Einstein's theory gives the dielec. const. of space to be $(1 + \mu r^2)^{-1}$. F. R. B.

Transference numbers of ions in solid sodium chloride at high temperatures. T. E. Phipps and R. T. Leslie. Univ. of Illinois. *J. Am. Chem. Soc.* **50**, 2412-21 (1928).—Transference expts. were performed on NaCl at temps. varying from 410° to 655°, a reversible Na anode and a Ni cathode being used. The fraction of the current carried by the Cl ion is practically zero between 410° and 510°. Between 558° and 655°, Cl ion carries a considerable part of the current. It is significant that the temp. region in which the change from uni-ionic to bi-ionic conduction occurs is the same as the temp. region in which the slope of the cond. curve (log k *vs.* $1/T$) doubles its value. In the temp. range 558° to 655° the fraction carried by the Cl ion appears to decrease with increasing temp. This is thought to be a polarization effect.
E. R. Smith

Striated discharge in hydrogen and helium. JOHN ZELENY. Yale Univ. *Phys. Rev.* **29**, 609(1927).—With increasing pressure and under const. current, the striated discharge between cold electrodes in H passed through a min. and then through a max. with still higher pressures. The pressures at which reversals occur depend on the current and other factors. Measurements of stria distance for He, H, air, and O are also given. S. L. B. ETHERTON

A spectrometric determination of the intensity and energy distribution in the cross section of the positive column in helium and neon. GERHARD ZWIEBLER. Physik Inst., tech. Hochschule, Berlin. *Ann. Physik* **86**, 241–90(1928).—The intensity and energy distribution for 14 spectral lines of Ne and 3 of He have been detd. at 5 points on the radius of the positive column in these gases by means of a Kurlbaum spectrometer. The intensity decreases rapidly from the center of the beam to the wall of the tube. At a distance of $^1/_{12}$ the radius from the center the intensity had diminished to $^1/_2$ its value at the center. The % decrease in energy from the center of the column outward, with const. pressure, decreases almost proportionately with the current through the tube, and, with const. current, increases with the pressure. The intensity of the single spectral lines increases more than proportional to the increase of the current. A. J. KING

Mobilities of ions in hydrogen gas mixtures and the constitution of the ion. LEONARD B. LOEB. Univ. of Calif. *Phys. Rev.* **29**, 751(1927); cf. *C. A.* **22**, 1903.—Recent measurements of mobilities in HCl-air mixts. indicate that there is an increased concn. of HCl gas around the ion, the effect being greatest for the neg. ion. Expts. in the H_2-ether and H_2-NH_3 mixts. indicate the following. Small quantities of ether lower the mobility of the ion in H_2 abnormally, but the effect on the −ion can be calcd. from the law of mixts. Minute traces of NH_3 in H_2 increase the mobility of the +ion nearly to that of the −ion. More NH_3 in H_2 lowers both mobilities more than the law of mixts. demands. In a mixt. of NH_3, ether, H_2 the effect on the +ion could be calcd. from the observed combined effects of what the ether alone produced added to what the NH_3 would have produced on a normal +ion in H_2 without the increase due to NH_3 alone. These results can only be explained on the assumption that the ionized mol. or atom adds itself to at least one more mol. to make a +ion, a conclusion agreeing with that of Erikson obtained on other evidence. S. L. B. ETHERTON

Formation of negative ions. A. P. ALEXEIEVSKY. Univ. of Calif. *Phys. Rev.* **29**, 752(1927).—When an electron approaches a gaseous mol. the latter is polarized and attracts the electron with a force approx. $f = (D - 1)e^2/2\pi r^5N = K/r^5$ (Langevin's expression), where D is the dielec. const. of the gas, N is the no. of mols. per cc. of gas, e is the electronic charge, and r the distance between the electron and the center of the mol. The attached electron probably moves in an orbit, part of which lies within the mol. core. On the assumption the electron cannot move within the core all the time, it is shown that all possible periodic orbits within a circle whose radius $r = (Km)^{1/2}/p$, where m is the mass and p the angular momentum of the electron. If the least amt. of angular momentum an electron can have is one Bohr unit, all periodic orbits must lie within the circle of radius $R = 2\ (Km)^{1/2}h$, where h is Planck's const. For He and A, $R <$ radius of the core, and for gases with large dielec. const. R is $>$ the probable radius of the core. S. L. B. ETHERTON

Ionization of mercury vapor by λ2537. PAUL D. FOOTE. Bur. of Standards. *Phys. Rev.* **29**, 609(1927).—Measurements of the photoelec. effect in Hg vapor were made by the method of Mohler, Foote and Chenault (*C. A.* **20**, 1351). If I = illumination and Δi the photocurrent, the relation $\Delta i = AI^2/(I + BI)^2$ holds, where A and B are consts., from 25° to 60°. Admixed N_2 greatly increases and H_2 decreases the effect. Since the above relation approaches $\Delta i = AI^2$ for small intensities, 2 separately excited atoms are involved in the ionization process. The complete mechanism of the ionization process is considered in some detail. S. L. B. ETHERTON

Movements of striae in discharge tubes under varying pressures. L. H. DAWSON. Naval Research Lab., Washington, D. C. *Phys. Rev.* **29**, 610(1927).—On varying the pressure the striae of the column of a discharge tube move. By measuring the pressure with a Mcleod gage, curves of the movement have been obtained as a function of the pressure, distance between electrodes, diam. of tube, and density of the current, for wet and dry H, He, N, air, CO and CO_2. S. L. B. ETHERTON

Excitation of mercury vapor by ions. ERNEST J. JONES. Univ. of Minnesota. *Phys. Rev.* **29**, 611(1927).—Satd. Hg vapor at 90° as bombarded with +K ions from a Kunsman source and the resulting radiation from a field-free space was photographed through a quartz spectrograph. At 160 v. only the 2537 line appeared after 6 hrs.' exposure with an av. ion current of 1.5×10^{-8} amps. At 646 v. after 4 hrs. with ion current

of 2 × 10^{-5} amp. 2537 (1S − $2p_2$), 3126 ($2p_1$ − $3d_2$), 3132 ($2p_1$ − $3d_4$), 3650 ($2p_1$ − $3d_1$), 4046 ($2p_3$ − 2s) and 4358 ($2p_2$ − 2s) were obtained. Comparison with the spectra excited by the electrons shows (*a*) the efficacy of excitation by + ions is far less than that by electrons; (*b*) that it increases with the velocity up to 1200 v.; (*c*) that up to 1200 v. the probability of excitation to the $2p_2$ level is > than to higher levels; (*d*) up to 1200 v. the excitation to levels higher than $3d_{1,2,3}$ is not observed with 4 hrs.' exposure and current of 2 × 10^{-5} amp. S. L. B. Etherton

Inelastic collisions in ionized gas mixtures. Gaylord P. Harnwell. Princeton Univ. *Phys. Rev.* **29**, 611-2(1927); cf. *C. A.* **21**, 2427.—By means of a positive-ray app. the variation with pressure of the ionization by electronic impact in mixts. of rare gases with H_2 and N_2 was studied. In equal proportions of H with He, Ne and A, the no. of rare-gas ions decreased below a pressure of 0.05 mm. At this pressure the mean free path is about equal to the dimensions of the app. H_2 decreased slightly with the pressure. H_1 and H_3 increased. Similar results were obtained with N. The results are considered definitely to prove the existence of a type of collision of the second kind resulting in ionization by positive ions. S. L. B. Etherton

Equipotential surface electrons as an explanation of the packing effect. W. E. Deming. *Phys. Rev.* **31**, 453-65(1928).—Theoretical. With static models of the He nucleus, packing can be satisfactorily accounted for by postulating that the electrons and protons shall be equipotential surface distributions having the usual total charges and radii, whereas ordinary electrons account for only 10% of the effect. With dynamic models, neither kind offers a soln. B. C. A.

Electronic discharge from cold wires in intense electric fields. R. J. Piersol. *Phys. Rev.* **31**, 441-7(1928).—The curves obtained by plotting the potential gradient against the logarithm of the electronic current for outgassed W at 27° and −180° are not linear. B. C. A.

Studies on the electron emission from metals and its dependence upon the change of state of the material of the cathode. II. The fusion diagrams of silver, gold and copper. A. Goetz. *Z. Physik* **43**, 531-62(1927); cf *C. A* **21**, 3154.—The method described in the previous publication has been applied in the measurement of the electronic emission of Ag, Au and Cu taking place during the process of fusion and crystn. of these metals. Other phenomena are described which are observed when metals are fused or crystd. in a high vacuum. E. K.

The measuring of lags in discharge. Wm. Clarkson. Univ. of Utrecht. *Phil. Mag.* [7], **6**, 312-7(1928); cf. *C. A.* **21**, 3544 —Discussion of methods. G. G.

The reflection of electrons. S. Szczeniowski. *Compt. rend.* **187**, 106-9(1928).—For certain incident angles "reflection" of electrons at cryst. surfaces is to be expected. The angles of diffraction obtained by Davisson and Germer with a Ni crystal did not agree with the calcd. values. Using a method analogous to that of Debye and Scherer, G. P. Thomson obtained results agreeing with theory. S. repeats the expts. using cathode rays on the cleavage surface of a Bi crystal for 3 different potentials and for different incident angles and with electrons from a W filament. The preliminary results obtained confirm deductions from the theory and more accurate measurements will follow. S. L. B. Etherton

Secondary electrons from cobalt. Myrl N. Davis. *Proc. Nat. Acad. Sci.* **14**, 460-5(1928).—The secondary electron emission from Co is found to be very great, the maxima being more pronounced and the minima greater than the corresponding values for other metals. Fe and Ni roughly correspond in the type of function obtained, but the maxima shift toward higher primary energies with increasing at. wt. (not at. no.). Some technical details which are in controversy are discussed. W. T. R.

Diffraction of cathode rays by mica. I. Seishi Kikuchi. Inst. Phys. and Chem. Research, Tokyo. *Proc. Imp. Acad. Tokyo* **4**, 271-4(1928).—With cathode rays the attempt has been made to obtain patterns analogous to the Laue x-ray pattern. Fairly homogeneous rays from a gas tube were found satisfactory. The exptl. set-up is similar to that of G. P. Thomson (*C. A.* **22**, 1723). Thin sheets of mica were used as the diffracting medium. Plates of different thickness were tried. The exact dimensions are unknown but were probably about 10^{-4} cm. The cathode ray beam was usually perpendicular to the mica plate, but sometimes purposely tilted. Two general types of pattern resulted, depending upon the thickness of the mica plates. The thinner plates gave a simple pattern consisting of 3 series of parallel lines intersecting at about 60°, thus forming a triangular net, of which the net points appear as an array of spots. Enhanced spots near some of the net points also appear. Increasing the potential decreases the distance between the parallel lines, the product of this distance and the sq. root of the potential remaining nearly const. It is assumed that this pattern

represents the diffraction figure from a 2-dimensional lattice with scattering points arranged in an equilateral triangular network. Such an arrangement of atoms is possible from the symmetry of mica. The interference of waves from successive planes, which must exist in the mica sheet, would seem to have little effect. The distance between atoms, on this assumption, is 4.1 A. U. The enhanced spots are possibly indications of the 3-dimensional character of the mica sheet. II. *Ibid* 275–8.—Patterns of the second type, *i. e.*, from the thicker sheets of mica, are, unlike the first type, affected by the orientation of the sheet. The patterns generally have four elements: spots, rings and black and white lines. The distribution of these elements depends more upon the orientation of the mica sheet than on the potential. *Conclusions:* The spots are similar to Laue spots. The configuration of the concentric rings depends upon the specimen orientation, and apparently may be explained as due to diffraction from a linear array of atoms making a small angle with the cathode-ray beam. The cause of the lines is not clear. R. L. Hershey

Collisions of the second kind between zinc and mercury atoms. J. G. Winans. Univ. of Wis. *Phys. Rev.* **29**, 213(1927).—Evidence has been obtained that Hg atoms in the $2P$ state are effective in collisions of the second kind with Zn atoms. A quartz tube contg. Zn and Hg vapors was illuminated by nearly monochromatic light of λ 1849 ($1S - 2P$) obtained by a focal isolation method from a hot Hg arc. The Zn sharp triplet ($2p_{1,2,3} - 2s$) appeared very clearly in the secondary radiation and failed to appear when all wave lengths shorter than 2100 were absorbed from the exciting light by a sheet of thin glass. Similar results were obtained by using the water-cooled Hg arc and the Al spark as light sources. λ1849 has been photographed through an air path of 90 cm. The Zn lines which appear when various light filters are placed in the path of the exciting light from a Hg arc, give evidence that some Hg atoms in the $3d$ state transfer their entire energy to Zn atoms in collisions of the second kind. A calcn on the basis of the kinetic theory shows that, under these exptl. conditions, an excited Hg atom with an associated metastable state is probably about twice as effective in producing collisions of the second kind as one with no metastable state near it. R. L. Hershey

Impact polarization and the spinning electron. A. Ellett. *Phys. Rev.* **29**, 207–8 (1927).—In most cases lines of the Hg spectrum for which ΔR during the collision is ± 1 exhibit polarization of the type to be expected if the Zeeman levels for which $m = \pm 1$ are favored in excitation, whereas if ΔR in excitation is zero the assumption that the level $m = 0$ is favored lends to the correct conclusion. On the spinning-electron hypothesis these results may be interpreted by saying that when R changes the spinning electron turns over during the collision and gives to the atom a unit of angular momentum parallel to the electron beam, and to the magnetic field which may be applied in this direction without changing the resulting polarization. Likewise, $1s - 2p_1$ of Na should show zero polarization and $2p_2 - 3d_3$ of Th should show polarization, if the reorientation of the spinning valence electron relative to the orbital momentum is brought about by the colliding electron turning over. If this is not true, the latter should behave like D_2 of Na. R. L. Hershey

The variation of ionization in a short-period variable star. II. Second order ionization. Georges Tiercy. *Arch. Sci. Phys. Nat.* **10**, 5–18(1928); cf. *C. A.* **22**, 1537.—An equation is developed to express the ionization of the second order, similar to that of the first order except for altered coeffs. and a different entropy const. Conclusion: Ionization of the second order has not reached measurable proportions in S. V. Casseopeia, the Cepheid especially considered. The ionization Si^{++} is considered in relation to the varying temps. at different levels in other stars. W. T. Richards

Secondary electron emission from molybdenum. Albert W. Hull and J. M. Hyatt. General Electric Co. *Phys. Rev.* **29**, 214(1927).—A special 3-electrode tube was used, consisting of a short straight W filament in the axis of a long cylindrical Mo grid and plate. The tube was thoroughly exhausted, a small quantity of Cs introduced, the tube sealed off from the pump, and the plate bombarded with Cs positive ions at 600 v. for 5 hrs. The tube was then immersed in liquid air and the plate heated by induction until the plate current showed no change with continued heating. Measurements of plate current were made, as a function of grid and plate voltage from 0 to 2000 v. The fraction of the primary electrons which reached the plate was detd. by removing the tube from liquid air, reversing the potentials, and measuring the positive-ion currents from the filament K grid and plate. The no. of secondary electrons per primary electron was thus calcd. and found to increase from 0.45 at 20 v. to a max. of 1.23 at 900 v., decreasing to 1.04 at 2000 v. These values were reproducible at different times and in different tubes to 2%. R. L. Hershey

Secondary electron emission produced by positive cesium ions. J. M. HYATT. Union College. *Phys. Rev.* 29, 214(1927).—The source of positive ions, a short W filament maintained at about 1200° K. in the presences of Cs vapor, was mounted on the axis of a long, cylindrical Mo grid and plate. A potential of —600 v. was applied to the grid and potentials from +50 v. to —650 v. to the plate. While the plate was between +50 and 0 only secondary electrons from the Cs-covered grid reached it. When the plate potential became negative it caught positive ions in addition to secondary electrons. The plate current became const. at —50 v. and remained so until the plate potential reached that of the grid. Then the plate current suddenly increased 4% in consequence of the emission of secondary electrons from the plate. Further increase of positive-ion velocities was accompanied by a uniform increase of secondary electron emission. Similar observations were obtained with the grid maintained at 6 lower potentials. Detns. of the secondary electron emission from both grid and plate were in agreement and showed that the no. of secondary electrons per positive ion striking the Cs surfaces increased uniformly from 0.02 at 200 v. to 0.11 at 600 v.

R. L. HERSHEY

Effect of an electric field on a radiating hydrogen atom. K. L. HERTEL. Univ. of Chicago. *Phys. Rev.* 29, 214-5(1927).—Canal rays of H are passed into a high vacuum so that the natural decay of radiation may be observed and the changes in polarization produced by a transverse elec. field during the radiation process. The original polarization is always suddenly reversed when the field is applied so that the elec. component parallel to the field becomes stronger. This change must take place in less than 2 $\times$ 10^{-9} sec. In the uniform field the polarization gradually decreases to 0 or even reverses slightly. Measurements made with different velocities of rays showed the time required for this gradual return of polarization is about 4 $\times$ 10^{-8} sec. Photographs of rays emerging from the condenser showed an increase in polarization of the light emitted, the component parallel to the field again being stronger.

R. L. HERSHEY

The nature of gaseous ions. HENRY A. ERIKSON. Univ. of Minnesota. *Phys. Rev.* 29, 215-6(1927).—When ionizing rays are passed through O_2, N_2, H_2, CO_2 and A a positive ion and a negative ion are formed. These have intially the same mobility in air, *i. e.*, 1.87 cm./sec. per v./cm. in moderately dry air. In a fraction of a sec the initial positive ion changes into a final ion with a mobility of 1.36. The negative ions undergo no change. No greater mobility in air than 1.87 is observed, which value is the mobility of the simplest singly charged body present. The lack of dissociation, the nature of the ionizing process, the results in the case of H, the possible sepn. of the two groups of ions and the like mobility of the initial as well as the final ions, lead to the conclusion that an electron escapes from the mol. by the action of the ionizing agent The initial positive ion is thus formed. The free electron attaches itself to a neutral mol., thus forming the negative ion. These are two 1.87 bodies. The positive 1.87 body soon shares an electron with a neutra mol., forming the 1.36 two-mol. body 1.87 is characteristic of a one-mol. and 1.36 of a two-mol. body. R. L. HERSHEY

Ionized hydrogen molecule. A. H. WILSON. Emmanuel Coll., Cambridge *Proc. Roy. Soc.* (London) **A118**, 635-47(1928).—The model proposed for the ion H_2^+ consists of one electron and 2 protons. To a first approxn., since the mass of the electron is relatively negligible, the protons may be considered as at rest. The system is thus a particular case of the problem of 3 bodies and can be solved completely classically. Pauli, who did this, obtained a value for the energy of the normal state differing from the exptl. result inferred from the ionization potential and the heat of dissociation Niessen, who also did this, obtained the exptl. result by introducing half integer quantum nos. By purely mathematical reasoning, W. obtains an analytical result with values for the energies in the various states. No soln. is in general possible but solns only occur for certain distances apart of the nuclei. It seems these states are illusory and that there are no positive distances of the nuclei which gives real states.

S. L. B. ETHERTON

A new method of determining the mobility of ions or electrons in gases. R. J VAN DE GRAAFF. Queen's College, Oxford. *Phil. Mag.* [7], **6**, 210-7(1928).—The principle of the method is the same as that used for the detn. of the velocity of light by Fizeau, who employed a rotating toothed wheel as a periodic shutter to break up a beam of light into sections which travel a known distance and then again encounter the periodic shutter, which, depending on the time of arrival of the sections of the beam, either stops them or allows them to pass on. Thus the transmitted light may be observed as a function of the speed of rotation of the disk, and from this, by taking into account the geometry of the app., the velocity of light may be easily computed. The

app. used for the detn. of the velocity of ions works in an analogous way. An oscillating potential in combination with grids gives the shutter effect corresponding with that of the rotating toothed wheel of Fizeau. The mobility for H_2 is found to be 5.8 cm. at normal temp. and pressure. GEORGE GLOCKLER

Astrophysical estimates of ionization potentials of iron, yttrium and lanthanum. A. VIBERT DOUGLAS. *Nature* **121**, 906(1928).—From a study of the behavior of sensitive lines in the spectra of Cepheid variables it has been estd. that the ionization potentials are Fe 6.6, Y 6.6, La 4.9. These are in agreement with previously detd. values where available. W. T. RICHARDS

The distribution of energy among electrons rebounding from helium atoms. A. L. HUGHES AND L. W. JONES. Washington Univ. *Phys. Rev.* **29**, 214(1927).—A narrow beam of electrons of known velocity was directed in He at various pressures below 0.01 mm. A pair of slits selected those electrons rebounding at 90° ± 3°, and their distribution of velocities was measured by the magnetic-field method. The pressure used was sufficiently low to insure that the rebounding electrons had made but one collision. For electrons having energies ranging from 16 to 100 v., it was found that the rebounding electrons had exactly the same energy as they had before collision. It was noted that there were no electrons rebounding at 90° with a loss of energy corresponding to excitation or ionization. R. L. HERSHEY

The complete photoelectric emission from potassium. J. BUTTERWORTH. *Phil. Mag* [7], **6**, 1-16, 352(1928).—No evidence has been found for the existence of a positive photoelectric emission, and it has been shown that, if such an effect does exist, it is less than 10^{-7} times the negative emission, from the same surface, measured in these expts. It is shown that K has at least 2 work-functions corresponding to the wave lengths 9700 A. U. and 60,000 A. U. The results indicate that the "patches" of lower work function form a very small part of the whole surface, and can acquire the greater work function under the influence of prolonged illumination. GEORGE GLOCKLER

Progress and aims of absorption spectroscopy. G. SCHIEBE. *Z. angew. Chem.* **41**, 687-90(1928). E. H.

Photoelectricity. WM. BRAGG. *Proc. Roy. Inst. Gt. Brit.* **1928**, Jan., 11 pp.—An address setting forth some of the phenomena of the field difficult of explanation according to present theory. WILLIAM E. VAUGHAN

Relative probabilities of the photoelectric emission of electrons from silver and gold. F. K. RICHTMYER AND L. S. TAYLOR Cornell Univ. *Phys. Rev.* **29**, 353-4(1927).—More careful data than those reported in *Phys. Rev.* Jan., 1926, have been taken through the K absorption limit of Ag and Au, by using slits about 5 x-units wide. The value of R_L^K computed from the magnitude of the discontinuity in the mass absorption coeffs. through the limit depends entirely on the magnitude of the correction for scattering. L. D. R

New measurements upon the light-sensitiveness of crystalline selenium. A. M. MACMAHON. Univ. of Chicago. *Phys. Rev.* **29**, 219(1927).—A 3-parameter family of curves, showing the change in the elec. current through a single, well-tested specimen of cryst Se as a function of the time, when the intensity and wave length of the incident light and the applied potential difference are separately varied, is given. The expression $i - i_0 = A(1 - \epsilon^{-at}) + B(1 - \epsilon^{-bt})$, where i is the current and t the time of illumination and A, B, a and b are consts., fits the exptl. results well. The work is largely preliminary. R. L. HERSHEY

X-ray analysis of silver aluminum alloys. A. F. WESTGREN AND A. J. BRADLEY. Metallographic Institute, Stockholm. *Phil. Mag.* [7], **6**, 280-8(1928).—An x-ray analysis of the Ag-Al system has confirmed the statement of Petrenko (*Z. anorg. Chem.* **46**, 49(1905)), that it has 2 intermediate phases at ordinary temp., both formed through transformation in the solid state. As Petrenko also found, one of them is Ag_3Al. It is cubic, having an elementary cube with an edge of 6.920 A. U., contg. 20 atoms. It is isomorphous with β-Mn. The other intermediate phase, which is homogeneous in a range from 27 to 40 atomic %. Al is a solid soln. of close-packed hexagonal structure. Its lattice dimensions change continuously from a_1 = 2.865 A. U., a_3 = 4.653 A. U and a_3/a_1 = 1.625 when satd. with Ag to a_1 = 2.879 A. U., a_3 = 4.573 A. U. and a_3/a_1 = 1.588 when satd. with Al. GEORGE GLOCKLER

Further test of the theories of absorption of x-rays. F. K. RICHTMYER AND L. S. TAYLOR. Cornell Univ. *Phys. Rev* **29**, 606.—It was impossible to decide between Kramer's and de Broglie's theory of absorption. Present measurements on Mo (42), Ag (47) and Sn (50) and the ratio of K to Z absorption favors de Broglie but Kramer's theory gives a better value for the abs. magnitude of K at the K limit. S. L. B. E.

Investigation of metal films by x-ray analysis. KARL HOROVITZ. Univ. of Chicago. *Phys. Rev.* **29**, 352(1927).—By means of the focusing x-ray spectograph metallic films deposited in high vacuum by at. rays have been studied. The films were analyzed where they were formed and in vacuum. K films were investigated at temp. of liquid air. Mirrors 0.15 mm. thick gave a body-centered cubic lattice, $a = 5.15$.
L. D. R.

Possible dependence of frequency of characteristic x-radiation on the temperature of the target. J. H. PURKS AND C. M. SLACK. Columbia Univ. *Phys. Rev.* **29**, 352 (1927).—Water-cooled and standard Coolidge tubes were used to investigate a possible change of frequency of Mo $K\alpha$ with the temp. of the target. The energy used made the target of the second tube white hot. Negative results were obtained. L. D. R.

Velocity and number of the photoelectrons ejected by x-rays as a function of the angle of emission. E. C. WATSON. California Inst. Tech. *Phys. Rev.* **29**, 751–2 (1927); cf. *C. A.* **21**, 3309; **22**, 2320.—Magnetic spectra of the electrons ejected by x-rays from thin metallic films at angles between 0° and 180° with the x-ray beam have been measured by the method or Robinson, de Broglie and Whiddington. The max. velocity of ejection is the same in all directions. With thin foils of the heavier metals the no. of electrons ejected with this max. velocity is approx. the same. With foils of very light elements or with sputtered films that come under Wentzel's criterion, for single nuclear scattering, the no. of electrons ejected is greatest in a direction a little forward of the perpendicular to the x-ray beam. On the assumption that all electrons sent out from the atom go in the same direction the no. of electrons leaving can be calcd. by the theory of scattering. S. L. B. ETHERTON

Valence and Röntgen spectra. OTTO STELLING. Lund Univ. *Svensk. Kem. Tids.* **40**, 135–48(1928).—S. summarizes his 7 contributions on the relation of chem. constitution to Röntgen-ray to absorption spectra (*C. A.* 19, 3423, 2424; *Dis Lund* **1927**). The valence problem is stressed and instances are given wherein spectrum measurements clarified the constitution of org. compds. Eight tables give the K absorption spectra measurements by Bergengren (*C. A.* **15**, 207) and Lind (*C. A.* **15**, 3586; **16**, 3435). A. R. ROSE

The photoelectric effect of soft x-rays. G. B. BANDOPADHYAYA. King's College, London. *Proc. Roy. Soc.* (London) **A120**, 46–58(1928).—In an app. that was very carefully degassed at a pressure of 10^{-7} mm., 12 elements, C, Al, Fe, Co, Ni, Cu, Mo, Ag, Ta, W, Pt and Au, were subjected to the action of soft x-rays from a Cu anticathode at voltages ranging from 200 to 500 v. The photoelec. current was measured by an electrometer and the thermionic current with a micro-ammeter. The values of $\frac{\text{photoelec. current}}{\text{thermionic current}}$ are recorded for the above elements and also for Al, Fe, Ni, C, Ag, Au and Pt when the photoelec. plates were not degassed. The latter values were generally higher than those with the elements degassed. No simple relationship was discovered between photoelec. efficiency and at. no., the sensitivity of the elements under soft x-rays being quite comparable to that under ultra-violet light. Theoretically, the no. of photoelectrons liberated should be proportional to the voltage, a supposition that B. finds to be approx. true. MALCOLM DOLE

X-ray studies on the "nitrides" of iron. GUNNAR HÄGG. *Nature* **121**, 826–7 (1928).—X-ray examns. by the powder method have been made of Fe "nitrides" prepd. by passing NH_3 over pure Fe, prepd. by reducing Fe oxides with H_2. The structure is dependent only on the N content and not on the method or conditions of prepn. The max. N content is 11.3%. The "nitrides" are really solid solns. of N in Fe. At 0.2% N faint lines of a face-centered cubic lattice begin to appear; all α-Fe lines have disappeared at 5.7% N. The new lines remain fixed as N increases and indicate a unit cube of edge 3.789 A. U. somewhat larger than that of γ-Fe. However, this is called the γ-phase and is considered to be a solid soln. of N in γ-Fe. The Fe atoms are in a close-packed cubic array, with N atoms in the interstices. No evidence that the N atoms are regularly arranged appears. A new phase, ϵ, appears between 5.7 and 6.1% N. It is hexagonal close-packed, the unit cell remaining fixed in size at first, but beginning to increase between 7.3 and 8.6% N. The phase is estd. to become homogeneous between 7.5 and 8% N. The ϵ parameters are the $a = 2.695$ A. U., $c = 4.362$ A. U. Increase in N increases the parameters, c increasing relatively less than a. The ϵ phase is a solid soln. of N in hexagonal close-packed Fe. A thin Fe sheet nitrided at 450° for 4 hrs showed strong γ and weak ϵ lines.
R. L. HERSHEY

A new method of obtaining x-radiograms. K. V. VASIL'EV. *Trans. Inst. Econ. Mineral. Met.* (Moscow) **1928**, No. 34, 45–58.—The specimen is mounted in a circular

hole in the center of the film. The beam is bisected by the film, *i. e.*, the plane of the film includes the axis of the beam. The reflected rays are recorded as radial streaks originating at the center of the film. R. L. Hershey

The general x-radiation from mercury vapor. Wm. Duane. *Proc. Nat. Acad. Sci.* **14**, 450(1928).—A continuous x-radiation results from the impacts of electrons against Hg vapor atoms. It is not homogeneous either in the direction of the electron stream or normal to it, since in both cases it becomes more and more penetrating as it passes through successive layers of Al. The percentage intensity of radiation passing through successive Al sheets agrees well with the values calcd. from the law of D. L. Webster, which states that the x-radiation from an indefinitely thin target should have a max. of intensity at the short wave length limit, and should decrease beyond this limit with increasing wave length as the inverse square of the wave length.
W. T. Richards

Procedures for obtaining Debyegrams. K. V. Vasil'ev. *Trans. Inst. Econ. Mineral. Met.* (Moscow) 1928, No. 34, 36–44.—The paper is a review of the well-known methods of prepg. powders for Debye-Scherrer pictures. R. L. Hershey

X-radiation from gases. Albert Bjorkeson. Univ. Upsala. *Nature* **122**, 14–5 (1928).—A crucible contg Na was bombarded by electrons in a vacuum. A screen of brass, with a small Al window placed beside the crucible and a photographic plate constituted an x-ray pinhole camera. A blackening on the plate corresponding to the image of the crucible appeared when Na was in the crucible, no blackening showed when the crucible was empty. Similar expts. with S, using a vacuum spectrograph and a gypsum crystal as a grating, gave the K_α line of S. Five lines were obtained with the crucible elec. heated, an electron current of 90 milliamp. and a potential of 6000 v. The two strongest correspond to K_α and K_β; the others were too weak for wave-length detns. R. L. Hershey

A theory of the mechanism of crystal growth. Wheeler P. Davey. *Phys. Rev.* **29**, 206(1927).—It is suggested that crystn. proceeds, not uniformly along a plane surface, but along a three-dimensional lattice which is later filled in. This may be observed in the crystn. of photographic hypo from a supersatd. soln., in the contraction cavities of large-grain pure Cu crystd. in dry O_2-free H_2, in the end of a single crystal of Cu from which the molten Cu had been suddenly removed, on the surface of Cu cast in H_2, and in the surface skin surrounding single crystal Cu. The material crystg. later in the lattice is under tension, *i. e.*, all crystals are produced in a state of strain. This explains etching pits, "solution cavities," dendrite formation and the imperfections in crystals noted in x-ray work. R. L. Hershey

The intensity of the reflection of x-rays by crystals and the Compton effect. G. E. M. Jauncey. *Phys. Rev.* **29**, 206(1927).—The formula of Bragg, Darwin and James for the case of an ideally imperfect crystal, including corrections for extinction and temp. demands greater intensity at high orders than expt. shows. A further correction due to the Compton effect is suggested, it being supposed that only those electrons which are in orbital positions U such as to scatter unmodified rays take part in the cryst. reflection of x-rays. J.'s theory of the unmodified line gives the ratio of the numbers of electrons in the U and M positions (*C. A.* **20**, 2943). A calcn. of the quantity F in the Bragg, etc., formula can then be made from this ratio on the assumption that the electrons in the U position scatter as a whole. R. L. Hershey

The difference of the lattice constants of rock salt and of chemically pure sodium chloride. Tom. Barth and Gulbrand Lunde. *Z. physik. Chem.* **126**, 417–24 (1927).—The lattice const. of a natural rock salt was found to be 0.002 A. U. larger than that of pure NaCl. The const. of the natural rock salt is taken as standard at 5.628 A. U. and the pure NaCl then has a const. 5.626 A. U. The difference is attributed to small quantities of KCl present in the natural rock salt. R. L. Hershey

The application of a valve amplifier to the measurement of x-ray and photoelectric effects. C. E. Wynn-Williams. *Phil. Mag.* [7], **6**, 324–34(1928).—A valve amplifier for the measurement of ionization currents of the order of 10^{-12} amp., possesses certain advantages over other methods of measurement. Its usefulness, however, is limited in that it cannot always be operated if an induction coil or similar impulsive high-potential app. was at work in its neighborhood. For this reason, its use for the measurement of the ionization currents produced by x-rays has been ruled out. Under certain conditions, and provided that suitable precautions are taken to screen the app., the difficulties in using it for x-ray measurements can be overcome, and, in addn., when employed in conjunction with a photoelectric cell, it can be used for photometric work.
George Glockler

The action of x-rays on colloidal ceric hydroxide. J. A. V. Fairbrother. *Phil.*

Mag. [7], 6, 385–401(1928).—A quant. study is made of the viscosity changes produced in $Ce(OH)_4$ hydrosol by x-rays. In sols of low concn. and with increasing x-ray doses the viscosity decreases to a min., then increases rapidly and the sol sets to a rigid gel. In more concd. sols the spontaneous increase in viscosity which takes place when the particles are discharged masks the initial decrease. The sols become more sensitive to x-rays with age, and the doses required to produce the max. decrease in viscosity and to set the sol to a gel become very much smaller, indicating that the charge upon the particles is decreasing. When the position of min. viscosity is reached the sol sets spontaneously to a rigid gel within the course of a few hrs. An x-ray dose sufficiently in excess of that required to produce the max. decrease will set the sol to a gel immediately (cf. *C. A.* **21**, 3827). In a particular sol studied the particles decreased in size up to the position of min. viscosity. The % decrease in size was almost equal to that in viscosity. Beyond the min. point the particles increased in size, reaching a max. at the setting point of 1.6 times the normal value. GEORGE GLOCKLER

The thermal measurement of x-ray energy. J. A. CROWTHER AND W. N. BOND. Univ. of Reading. *Phil. Mag.* [7], 6, 401–22(1928).—The energy of a beam of x-rays has been measured by converting it into heat in a calorimeter. The energy absorbed from the radiation for the formation of one pair of ions in air is 42.5 "volts." This value is const. over the range of wave lengths employed in the expts. The quantity of electricity, I, measured in electrostatic units across 1 cc. of air at 18° and normal pressure is given by $I = 1.70 \times 10^{-4} E\tau$, where E is the total x-ray energy in ergs which has passed through the gas, and τ is the "true" mass coeff. of absorption. The relation cannot be applied to a heterogeneous radiation, because of the impossibility of detg. τ for such radiation. GEORGE GLOCKLER

The determination of the atomic scattering power for x-rays from powders of gold, silver and aluminum for CuKα radiation. J. BRENTANO. Manchester University. *Phil. Mag.* [7], 6, 178–91(1928).—Expts. are described intended to obtain comparative values for the scattering power of Au, Ag and Al. The measurements are made with small powder particles, and a method is employed in which the intensities are measured from composite layers. Some points concerning this method, which makes it possible to overcome certain difficulties in measuring the intensities of x-ray reflections from powders are discussed, and the procedure is indicated for evaluating the photographic records. The results of the expts. indicate that, for the elements of high at. wt. examd. in the state of very fine powders, the scattered intensities increase considerably less rapidly than F^2 (negative charge at the atom) and that better agreement is obtained by assuming the scattered intensity proportional to F. GEORGE GLOCKLER

Multiple ionization and the absorption of x-rays. F. K. RICHTMYER. Cornell University. *Phil. Mag.* [7], 6, 64–88(1928).—The question has been raised: Are there in x-ray absorption spectra discontinuities corresponding to the so-called "spark" lines analogous to the K,L,K.... discontinuities corresponding to the diagram lines? The present evidence seems to indicate that the processes which give rise to the spark lines are secondary processes, and we should not, therefore, expect to find evidence concerning their origin in absorption spectra. But in any event the spark lines are so weak compared with the diagram lines that existing data on x-ray absorption-coeffs. are not sufficiently precise to detect such discontinuities as might occur. It is shown that a straight line (Moseley graph) results when one plots the square root of the difference in frequency between a spark line and its "parent" line as a function of at. no. This suggests the possibility that spark lines may originate in two-electron transfers. In making precise measurements of x-ray absorption-coeffs., it is necessary to use slits sufficiently narrow to eliminate the "slit-width" error. The magnitude of this error is computed for one special case, and it is shown that with slit-widths as wide as some which have been used, errors as large as several percent may occur in the neighborhood of 0.3 A. U. GEORGE GLOCKLER

Two electron multiplets of the first and second long periods. H. C. WHITE AND R. C. GIBBS. Cornell Univ. *Phys. Rev.* **29**, 359(1927).—W. and G. have found that three characteristic multiplets arising from two valence electron systems of the first and second long periods follow the so-called regular and irregular doublet laws. The multiplets have been extended in the first long period from Ca_I to Cr_V, and in the second long period from Sr_I to Cb_{IV}. L. D. R.

The series relation of the neon spectrum. Y. ISHIDA. Supplement to *Sci. Papers Inst. Phys. Chem. Research* 9, No. 6, 3 pp. W. F. MEGGERS

A fine quantum analysis of certain terms of thallium I. MASAMICHI KIMURA. *Sci. Papers Inst. Phys. Chem. Research* **154**, 51–6(1928).—An analysis of the hyperfine structures of Tl lines observed by Mohammad and Mathur (*C. A.* **22**, 2885) suggests

that the 2 p_1 and 3 d_3 terms are each three-fold with interval ratio of 3:2, while 2 p_2, 3 d_1 and 2 s are triple with interval ratio 2:1. Assigning fine quantum nos. to the sublevels and arranging the fine structure components as multiplets indicates that the selection principle governing the occurrence of the observed components is the same as that of inner quantum nos.; if a fine quantum no. of a subterm is denoted by f, then its selection principle is expressed by $\Delta f = \pm 1$, or 0, excluding the change from $f = 0$ to $f = 0$. W. F. MEGGERS

Limits of ultra-violet transmission of certain inorganic compounds. MASAMICHI KIMURA AND MATAICHIRO TAKEWAKI. *Sci. Papers Inst. Phys. Chem. Research* 155, 57–64(1928).—The ultra-violet transmissions of a no. of simple inorg. compds. in a solid state were examd. by reducing the samples to fine powder, filling a hollow quartz wedge with these powders and photographing the spectrum of a condensed spark projected on the spectrographic slit through the wedge. Curves are sketched to represent the spectrographic records. Examn. of these curves shows that colorless compds. of alkali and alk. earth metals are more transparent to the ultra-violet than the compds. of other metals. In halogen compds. of metals the ultra-violet limits of the transmission displace towards the red in the order of chlorides, bromides and iodides. Colorless chlorides of metals are generally the most transparent compd. of the metals. Nitrates of Li, Na, K, Mg, Zn, Cd, Ca, Ba, Al, Pb, Bi, Co, etc., cut off ultra-violet below 320μ; this is caused by the presence of the NO_3 radical. Oxides of Cd, Pb, Sn, Bi, Sb, Zn, Hg, Co, Fe, Ni and Ag cut off ultra-violet strongly but those of Mg, Ca and Al transmit it. All of the sulfides examd. absorbed the rays strongly. Comparison of the ultra-violet limits of transparency of metals in each group of the periodic table shows that in the groups of (Li, Na, K), (Mg, Zn, Cd) and (Sn, Pb) the limit shifts towards the red as the at. wts. of the metals increase, while in the group (Ca, Sr, Ba) the reverse seems to be the case. W. F. MEGGERS

Technic of spectral analysis. TR. NEGRESCO. *J. chim. phys.* 25, 216–33(1928).—A flame of the alloy to be analyzed was obtained by causing the air that is to be used in the burner to blow over a spark from 2 electrodes of the metal. The spark and arc of the metal were also studied. The images were projected into the slit of the spectrograph by means of a quartz lens. The spectrograph was so constructed that 20 spectra, one above the other, could be obtained on a single photograph; it could be used in the region between the 2 lines of Fe, λ2309 and λ6380 A. U. To verify lines sought for, Co and Ba were used as reference spectra. The developer used consisted of 1 l. H_2O, 10 g. hydroquinone, 40 g. Na_2SO_3 and 55 g. Na_2CO_3. A fresh soln. was used for each plate. Errors are possible due to the app., sensitivity of the plates and reading of the spectrograms. N. does not believe that the spectrum of an element is independent of the compd. in which it is found. E. G. VANDENBOSCHE

Predicted lines of Cr II in the spectra of the sun and of α Persei. THEODORE DUNHAM, JR. AND CHARLOTTE E. MOORE. *Astrophys. J.* 68, 37–41(1928).—In the spectra of the sun and of α Persei 33 previously unidentified lines have been established as members of the first spark spectrum of Cr. These lines have been identified on the basis of combinations of various terms of Cr II, and although they have not been found as emission lines in lab. sources, yet they occur as absorption lines in the solar and stellar spectra. C. C. KIESS

The presence of the rare-earth elements in the sun. CHARLES E. ST. JOHN AND CHARLOTTE E. MOORE. *Astrophys. J.* 68, 93–108(1928).—Ten rare-earth elements are present in the sun, as shown by the agreement of lines of their spectra with hitherto unidentified Fraunhofer lines. These elements are in the ionized state; they are La, Ce, Pr, Nd, Sm, Eu, Gd, Dy, Er and Yb. Probably present but not established with certainty are Il, Tb, Ho, Tu and Lu. These elements lie at low levels in the sun, being close to the photosphere, and exhibit characteristics which differentiate them from the lines originating in the neutral and ionized atoms of other elements. C. C. KIESS

... Liquid O and gaseous O at high pressure exhibit a no. of absorption bands between 3825 A. U. and 2490 A. U. which lie just to the red of a broad continuous band and increase in intensity with decreasing wave length. These bands are attributed to the mol. O_4. When the wave nos. of certain of these bands are plotted against arbitrary nos. in sequence it is seen that the bands form a progression. From the heat of dissociation of O_4 into O_3 and O the beginning of the broad absorption band is calcd. at 2470 A. U., which is close to the observed position. C. C. KIESS

The use of quartz rod or sphere for condenser in spectroscopy. H. NAGAOKA.

Sci. Papers Inst. Phys. Chem. Research (*Tokyo*) **8,** supplement no. 1, 1-3(1928). (In English.)—A quartz cylinder with one end plane and the other spherical is a useful means of concg. the faint light from an extended source on the slit of a spectrograph. A quartz sphere or a hemisphere may be similarly used. C. C. Kiess

The Stark effect of Balmer series at high field. Y. Ishida and S. Hiyama. *Sci. Papers Inst. Phys. and Chem. Research* (*Tokyo*) **9,** 1-14(1928). (In English.)—New observations of the Stark effect for members of the Balmer series of H have been made for very high elec. fields. The intensities of the components have been measured with microphotometers and the results have been compared with the different theories including the second- and third-order effects. On the whole the results appear to satisfy best the requirements of the wave mechanics both in respect to intensity and deflection. C. C. Kiess

Interferometer measurements of wave lengths in the vacuum arc spectra of titanium and other elements. C. C. Kiess. *Bur. Standards J. Res.* **1,** 75-90(1928).—Wave lengths of more than 300 lines of Ti I and Ti II as emitted in a vacuum arc have been measured with the Fabry-Perot interferometer. The spectral region covered extends from 6743 A. U. in the red to 2941 A. U. in the ultra-violet. For many of the lines the accuracy of measurement exceeds 1 part in 6,000,000; for the majority it exceeds 1 part in 4,500,000. From terms calcd. from lines measured near the Ne lines, which served as standards, it was possible to calc. the wave lengths in the blue and violet remote from the standards. The agreement between calcd. and observed wave lengths indicates that there is no error of scale affecting the results. In addition to Ti, some wave lengths are given for Fe, Cu, Ca, Ba, Na, Al, V, Cr, Mn and Ni. C. C. Kiess

The Compton effect and polarization. P. Lukirskii. *Nature* **122,** 275-6(1928).—Hard x-rays in the wave-length interval from 0.07 to 0.1 A. U. were directed to a block of paraffin from which secondary radiation was scattered. In consequence of the Compton effect the wave lengths of the scattered rays were increased. The secondary rays were directed to a second block of paraffin from which tertiary rays were scattered. The intensities of these were measured in different azimuths with respect to the elec. vector of the secondary rays. The results—max. intensity in a direction normal to the vector, min. intensity in the direction of the vector—show that the modified rays are polarized in the same manner as they should be in the case of classical scattering. C. C. Kiess

The Stark effect at very high fields. Yoshio Ishida. *Nature* **122,** 277(1928).—With elec. fields of 650 kv. per cm. the He line 7066 A. U. and the Li line 6702 A. U. hitherto not observed to be affected, were both shifted to the violet. A large no. of Ne lines were also found to exhibit complicated Stark-effect patterns; and for H_α the relative intensities of the *p* components were found to be in the ratio 22:65:45, a result in good accord with the requirements of the wave mechanics. C. C. Kiess

Molecular spectra in the extreme infra-red. C. V. Raman and K. S. Krishnan. *Nature* **122,** 278(1928).—The frequency differences between rays incident on a substance and the new rays in the light scattered by it, give the mol. frequencies of the scattering substance. This furnishes an accurate and powerful method of exploring mol. spectra, especially in the infra-red. In the case of CCl_4 three hitherto unknown infra-red lines, thus discovered, are 45.4μ, 31.8μ and 21.7μ. C. C. Kiess

Variation with state of the optical constants of cesium. J. B. Nathanson. Carnegie Inst. of Tech. *Phys. Rev.* **29,** 369(1927); cf. *C. A.* **19,** 1809.—At 23° and 33° the optical consts. of Cs were detd. for the solid and liquid states, for wave lengths 5400, 5890 and 6410 A. U. Changing from the solid to the liquid state the angle of azimuth of restored plane polarization and the phase difference between the component of the light vector parallel and perpendicular to the plane of incidence changed very little. L. D. R.

Zeeman effect and the structure of the arc spectra of copper and rhodium. L. A. Sommer. Harvard Univ. *Phys. Rev.* **29,** 358(1927); cf. *C. A.* **21,** 704.—S. agrees with Shenstone in the classification of the doublet term group ^2P, ^2D, ^2F, but does not agree regarding the classification of the higher doublet term group. L. D. R.

Some relations in the spectra of stripped atoms. R. C. Gibbs and H. E. White. Cornell Univ. *Phys. Rev.* **29,** 359(1927).—Starting with known values of the arc and spark spectra in one-electron systems in all three of the long periods, the first pair of doublets in the principal series for stripped atoms as far as Mn_{VII} in the first long period, Zr_{IV} in the second long period, and Pr_V in the next period have been recognized. The first pair of inverted diffuse doublets with satellite have been found for Sc_{III}, Ti_{IV} and V_V. Evidence indicates that Sc_{III} presents, as predicted by Bohr, a closer binding in a *d* orbit than either in a *p* or an *s* orbit. L. D. R.

Energy-level studies on metallic vapors using a high-temperature tungsten furnace. O. S. Duffendack and J. G. Black. Univ. of Mich. *Phys. Rev.* **29**, 358(1927).—Cu vapor yielded new absorption lines at 2618.37, 2824.39, 2882.81, 2961.19, 3010.87, 3194.09 and 5782.08 all originating in the metastable $^2D_{2,3}$ level. Cu lines 3247, 3274, 5106, 5700 and Cu hydride bands were found in emission. All five lines originated in $2^2P_{1,2}$ level. This state was reached by absorption of resonance radiation—not thermal excitation. No absorption lines originated in this level. L. D. R.

Spectra of the high-current vacuum arc. Arthur S. King. Mt. Wilson Observatory. *Phys. Rev.* **29**, 359(1927).—Arcs of Fe, Cr, Ti, Mg, Cu and Si were studied in a vacuum chamber at about 5 mm. Hg under high current. The central stream of this arc at 1500 amp. and 110 v. is intensely bright and shows complete ionization. L. D. R.

Absorption spectra in the extreme ultra-violet. J. J. Hopfield. Univ. of Calif. *Phys. Rev.* **29**, 356(1927).—Under widely varying pressure, absorption spectra of N_2, air, C_2H_2 and CO were obtained. Selective absorption and a region of contiguous absorption on the short wave-length side are shown. C_2H_2 shows band absorption beginning at λ2300. "Four or five bands of an apparently new system in CO begin with either λ1696 9 or 1664.4 as the 0-0 band and continue with λλ1634.0, 1604.9, and 1577 6 as consecutive members." L. D. R.

Critical potentials of iron. Richard Hamer and S. Singh. Univ. of Pittsburgh. *Phys. Rev.* **29**, 608(1927).—The critical potentials of Fe were investigated up to 132 v. A long quartz tube enclosing 2 electrodes consisting of a central iron rod and a concentric iron cylinder was externally heated and breaks in the current-potential curve were taken to indicate crit. potentials. Twenty such values are given and the method is developed to differentiate between multiple and fine-structure potentials. S. L. B. Etherton

Multiplets in the spectra of vanadium. III. R. C. Gibbs and H. E. White. Cornell Univ. *Phys. Rev.* **29**, 606–7(1927).—Triads of the multiplets of V_{III} have been identified, the initial state is given by one 4p electron and two 3d electrons. In the final state the 4p electron has shifted to the 4s orbit. The sepns. of the $^4F_{2,3,4,5}$ levels closely agree with Lande's interval rule and the relative intensities of the lines in the multiplets conform to the usual rule. A comparison of the data for 1-, 2-, 3 electron systems of Sc, and Ti and V shows that the addn. of first one and then a second d electron caused not only an increase in the multiplicity but also successive shifts in the radiated lines towards the longer wave lengths by very nearly the same frequency interval. A multiplet of Cr has also been identified S. L. B. Etherton

Emission of light by flames containing sodium and absorption of light by mercury vapor. H. A. Wilson. Rice Inst. Texas. *Proc. Roy. Soc.* (London) **A118**, 362–6(1928). —The results found by Gouy sustain the equation $I = A\rho d/\sqrt{\rho dB}$, I being the light intensity perpendicular to the flame surface, ρ is the amt. of Na per unit vol., where d is the thickness of the flame, and A and B are consts. When ρd is not very small B may be neglected and the expression may be written $I = A\sqrt{\rho d}$, *i. e.*, the light intensity is almost proportional to the root of the amt. of Na in the flame. The substance which emits the light cannot be represented by an equation such as NaCl + HOH = NaOH + HCl for then the intensity will vary as the root of the Na concn. If the light is due to free metallic Na formed by the completely dissocd. NaCl, the intensity will be proportional to the amt. of Na, did not absorption occur by the Na atoms. The square-root law may be explained by assuming that the Na atoms absorb light at the centers of the D lines and treating the Na atom as a simple oscillator and making allowance for viscous resistance to motion, the elec. intensity in the light at the atom and the charge on the particle. The expression deduced has been applied to the recent results of Hughes and Thomas (*C. A.* **22**, 25) on the absorption of resonance radiation by the Hg vapor. Conclusion: The consistent view is that the atoms absorb light like simple damped oscillators. S. L. B. Etherton

Ultra-violet absorption spectra of anthracene, phenanthrene and anthraquinone. A. Castille. *Bull. acad. roy. méd. Belg.* [5], **8**, 74–82(1928); cf. *C. A.* **22**, 3019.—Anthracene has 10 bands between 3800 and 2850 A. U. and moreover 2 bands in the extreme ultra-violet Phenanthrene has 17 bands which can be divided in 3 groups: (1) between 3900 and 3000 A. U., 10 bands, (2) between 3000 and 2600 A. U., 5 bands, (3) in the extreme ultra-violet 2 bands. Anthraquinone: 5 bands between 4250 and 3600 A. U., 1 large band between 3500 and 2850 A. U., and 4 bands between 2800 and 2300 A. U. R. Beutner

A modified Hartmann diaphragm. J. R. Green. *J. Soc. Chem. Ind.* **47**, 224T

(1928).—With the usual 3-aperture Hartmann diaphragm, if more than 2 elements are to be looked for, a wave-length scale has to be used to identify the lines in the comparison spectra. By cutting the diaphragm in a step-wise and inverted step-wise pattern, the position of a particular comparison spectrum and the length of the lines in it identify the position of the diaphragm when the spectrogram is taken and therefore the element to which it belongs. The need for a wave-length scale is thus avoided provided the comparison spectra are given only short exposures. J. H. PERRY

The spectrum of triply ionized antimony, Sb IV. J. B. GREEN AND R. J. LANG. *Nature* **122**, 241(1928).—The following groups have been identified in the spectrum of Sb IV: a $^3P^3S$ multiplet, lying between 805 A. U. and 861 A. U.; a very strong $^3P^3D$ multiplet; between 873 and 940 A. U.; a $^3D^3F$ multiplet, between 2077 and 2113 A. U.; and a possible $^3P^3P^1$ group between 1051 and 1193 A. U. In addn., a $^1S^3P$ line and $^1S^1P$ line give an est. of 340,000 cm.$^{-2}$ for the lowest ^1S level, corresponding to an ionization potential of about 42 v. H. F. JOHNSTONE

New facts concerning the diffusion of light in crystals. G. LANDSBERG AND L. MANDELSTAM. *Compt. rend.* **187**, 109-11.—In *C. A.* **22**, 3837 L. and M. described a new effect observed when a spectrum of light is diffused by certain transparent crystals. Some of the "principal rays" of a Hg lamp are accompanied in diffused light by satellites displaced towards the red, whose frequency differs by a const. value from that of the principal ray. Raman and Krishnan (*C. A.* **22**, 1907) have published observations on the change in wave length in the light spectrum when diffused by certain liquids and gases. Apparently the phenomena are analogous. New results are obtained with light diffused through quartz and Iceland spar, these being the discovery of satellites symmetrically displaced towards the violet but much weaker than the former satellites. From $\lambda = 2482$ A. U. to $\lambda = 4358$ A. U., L. and M. found 72 satellites for quartz and 18 for Iceland spar whose positions are given in the paper. Five parallel series for quartz and 2 for Iceland spar are found. The value of $A\nu_i$ is probably equal to the frequency ν_i of the real vibration of the crystal. S. L. B. ETHERTON

The negative absorption of radiation. C. V. RAMAN AND K. S. KRISHNAN. *Nature* **122**, 12-3(1928).—Careful measurements of the scattering of monochromatic light by liquid C_6H_6 shows the presence of lines of modified frequency in the scattered radiation. The difference between the incident and scattered frequencies is exactly equal to an infra-red frequency of the mol. C_6H_6, radiated with light from a Hg arc, which has been filtered of all but the 4358.3 A. U. group of lines, shows the brightest scattered lines at wave lengths longer than 4358.3 A. U. There are two, however, at shorter wave lengths, and their frequencies exceed that of the 4358.3 line by the infra-red frequencies of the mol. This indicates the presence in the liquid of mols. more highly energized than normal, and that the incident radiation induces a return to a lower state of energy, *i. e.*, there is neg. absorption of radiation. R. L. HERSHEY

Spectroscopic interpretation of the magneton numbers in the iron group. A. SOMMERFELD AND O. LAPORTE. *Phys. Rev.* **29**, 208(1927).—For the spectroscopic interpretation of the measured magneton numbers for the ions of the first long period an av. of the $j.g$-values for the different levels of the polyfold ground-term must be taken. This was not necessary for the paramagnetism of the rare earths since the sepns. $\Delta\nu$ are so large that only the lowest level needs to be considered. The exact formula for the magneton no. (in Weiss-units) becomes: $\mu W = 4.97\ \Sigma N_j j(j+1)g(j,l,s)^2/(\Sigma N_j)^{1/2}$; j, l and s are the quantum nos. of the level in question and N_j is the weight: $(2j+1)(-hc\Delta\nu/kT)$. The terms which are assumed to represent the normal state of the ions are computed according to the Stoner Periodic System, the rules of Pauli and Hund being used. If the lowest term is of the S type the magnetic moments computed in the old fashion and those according to this formula must furnish the exact measured value; this is the case for Fe^{+++} and Mn^{++}. The Heisenberg-Schrödinger quantum mechanics do not alter the above formula. R. L. HERSHEY

The absorption spectrum of antimony vapor. R. V. ZUNSTEIN. *Phys. Rev.* **29**, 209(1927).—Mols. of Sb vapor slowly admitted into a hot C tube at about 1400° undergo dissocn. into atoms. The at. absorption spectrum was studied. The arc lines 2311.50, 2175.88, 2068.38 were strongly absorbed. 2023.86 and 2127.46 were absorbed less strongly. All 5 absorption lines come from the $3d_1$ state, which is the normal state of the atom. R. L. HERSHEY

Band spectrum, continuous emission, and continuous absorption of fluorine gas. HENRY G. GALE AND GEORGE S. MONK. Univ. of Chicago. *Phys. Rev.* **29**, 211(1927).—The band spectrum consisting of 10 bands between 5100 A. U. and 7200 A. U. has been photographed, a concave grating spectrograph being used. The zero points of the bands are given by $\nu = 17438.8 + (1104.9n' - 2.9n'^2) - (1071.5n'' - 9.9n''^2)$, yielding

frequencies, ν_0 = 19637.0, 18540.8, 17438.8, 16377.2, 15335.3, 14325.0; having vibrational quantum nos. $n'n''$ = 2,0; 1,0; 0,0; 0,1; 0,2; 0,3, resp. Analysis of the bands at ν_0 = 17438.8 and ν_0 = 16377.2, having the same initial vibration frequency, and satisfying the combination $R(m) - P(m)$, gives $2B = 3.8 \pm 0.4$, or, $J = 14.5 \times 10^{-40}$. A peculiarity of these bands is the increasing fuzziness of the lines from band to band toward the red. For exptl. reasons the emitter is believed to be the F_2 mol. In a spectrogram obtained by using a spark discharge in F 2 continuous emission bands are shown at approx. 2800 A. U. and 2600 A. U. Spectrograms of the absorption of F have been made, using gas columns, at atm. pressure, as short as 7 cm. and as long as 3 m. Continuous absorption occurs to the violet of 4100 A. U. No line absorption spectra were found. R. L. Hershey

Intensity relations and electronic states in spectra of diatomic molecules. Robert S. Mulliken. N. Y. Univ. *Phys. Rev.* 29, 211(1927).—The correspondence principle predicts definite intensity relations for P, Q, and R, band lines in mols. having a tional energy term $F = B(j^2 - \sigma^2) + \ldots$, provided σ is an electronic quantum no. corresponding to a precession about the internuclear axis (along which the angular momentum $\sigma h/2\pi$ is directed). Hönl and London have given equations for the 3 possible cases $\Delta\sigma = 0, \pm 1$. Let I represent intensity. Then for low values of j, the theory predicts $I_R > I_P$ if σ decreases during emission, but $I_P > I_R$ if σ increases, and $I_Q = I_P + I_R$, approx., in both cases. For $\Delta\sigma = 0$, the prediction is $I_P = I_R$, with I_Q small and falling with increasing j. Various band spectra have recently been interpreted by the writer as corresponding to electronic transitions $^1S \longrightarrow {^1S}$ (CuH type), $^1P \longrightarrow {^1S}$ (AlH), $^1D \longrightarrow {^1P}$ (H_2 λ5733), etc., with $\sigma = 0$ for ^1S, $\sigma = 1$ for ^1P and $\sigma = 2$ for ^1D states. These interpretations, and the proviso mentioned as to the nature of σ are completely confirmed in a comparison of available intensity data with the predictions of the theory. R. L. Hershey

Carbon monoxide band excitation potentials. Ann B. Hepburn. *Phys. Rev.* 29, 212(1927).—A hot-filament 3-element tube was used for visual and photographic detns. of the excitation potentials of the 0,0 bands of the Ångström, Comet's Tail, First Negative Deslandres, and Baldet-Johnson band systems of CO. Computations by Birge indicate that λλ4511, 4880, 2190, 3794 should be produced by electrons having a min. velocity corresponding to 10.7, 16.7, 19.8 and 19.8 v., resp. These expts. confirm the computations with an exptl. error (±0.1 v.). R. L. Hershey

Hydrocarbon bands. Frank C. McDonald. Univ. of Chicago. *Phys. Rev.* 29, 212(1927).—Two new bands, λ2264 and λ2367, found when CH_4 was led into a Wood tube and excited by a condensed discharge also appeared when acetylene, mixed with He, was excited by a transformer discharge. These bands have been arranged in P and R branches with a single missing line. They belong to the same system with a common initial state. The possibility of a CH ion as a carrier is considered. New plates with a high dispersion of a band, λ3143, originally reported by Fortat, have been obtained, but appear to show a somewhat different structure of the band than given by Fortat. R. L. Hershey

The titanium bands. R. T. Birge and A. Christy. *Phys. Rev.* 29, 212(1927).—The 28 well-known Ti bands have been arranged in one system and vibrational quantum nos. assigned. The heads are given by:

$$\nu = \left.\begin{matrix} 16{,}350.0 \\ 19{,}340.0 \end{matrix}\right\} + (833.1n' - 4.5n'^2) - (1003.5n' - 4.5n^2 - \ldots)$$

with an av. residual of 1 cm.$^{-1}$. The electronic energy change and the frequencies of vibration show a close correlation with the corresponding values for the Al bands, which are now definitely known to be due to AlO. The distribution of intensity among both the vibrational and rotational states is closely the same for the 2 mols. A preliminary est. of the moment of inertia shows a similar correlation. This seems to indicate that these bands are due to TiO and not to TiO_2. R. L. Hershey

Optically excited iodine bands with alternate missing lines. *R. W. Wood. The Johns Hopkins University and F. W. Loomis, New York University. *Phil. Mag.* [7], 6, 231-8(1928).—Some direct exptl. evidence is reported that, as predicted by the wave mechanics, the rotational states of symmetrical mols. are divided into two classes between which transitions do not occur. These classes of states are those whose eigenfunctions are resp. symmetrical and anti-symmetrical in the positional coördinates of the nuclei. The evidence has been obtained as the result of improvements in the technic of exciting iodine fluorescence. George Glockler

The Zeeman resolution of the oxygen line at 5577 A. U., the auroral green line. J. C. McLennan, J. H. McLeod and Richard Ruedy. Univ. of Toronto. *Phil.*

Mag. [7], **6**, 558–67(1928); cf. *C. A.* **21**, 1060, 1225.—The paper deals with a more exact detn. of the longitudinal Zeeman effect of the O green line λ5577. The line appears to be a forbidden transition. GEORGE GLOCKLER

The power relation of the intensities of the lines in the optical excitation of mercury. R. W. WOOD AND E. GAVIOLA. Johns Hopkins Univ. *Phil. Mag.* [7], **6**, 352–6(1928).—It was pointed out (*C. A.* **21**, 3830) that the anomalous behavior of 3650 was probably due to the fact that the line appears in fluorescence as the result of three successive absorption acts. Its intensity must then be proportional to the product of the intensities of the 3 exciting lines producing it, the absorption of which originates 3650. If the ratio of the intensities of the lines in the arc is const., the product of the intensity of 3 arc lines is proportional to the cube of the arc intensity. 3650 should vary then with the cube of the intensity of the exciting light. On the other hand, nearly all of the other lines that appear in fluorescence are originated by two successive absorptions. Their intensity must then be proportional to the square of the intensity of the arc. And finally the intensity of the resonance line 2537 should vary directly with the intensity of the arc. This prediction has now been proved quant. GEORGE GLOCKLER

New bands in the secondary spectrum of hydrogen. D. B. DEODHAR. King's College, London. *Phil. Mag.* [7], **6**, 466–79(1928).—D. describes 7 new bands in the secondary spectrum of H_2 situated in the yellow region (cf. *C. A.* **21**, 704). G. G.

The fine structure of three infra-red absorption bands of ammonia. G. A. STINCHCOMB AND E. F. BARKER. Univ. of Mich. *Phys. Rev.* **29**, 213(1927).—With a grating spectrometer with a rock-salt fore-prism, the fine structure of the 1.98μ, 2.2μ and 3.0μ bands of NH_3 was detd. The shape of the curve and the frequency differences for the 3.0μ band are in agreement with the results of B. J. Spence, although somewhat different values are assigned to the wave lengths. The 1.98μ band consists of about 30 lines spaced with fair regularity throughout the entire band. Its center is marked neither by an absent line, nor by a single zero branch of great intensity like that at 3.0μ. The frequency difference between adjacent lines approximates 10.0 cm.$^{-1}$ The 2.2μ band is extremely irregular, making the location of the lines somewhat uncertain and yielding no obviously characteristic frequency difference. No zero branch is apparent. R. L. HERSHEY

Factors governing the appearance of the "forbidden line" 2656 in the optical excitation of mercury. R. W. WOOD AND E. GAVIOLA. Johns Hopkins Univ. *Phil. Mag.* [7], **6**, 271–6(1928).—The necessary condition for the appearance of the forbidden line seems to be the formation of a large number of metastable atoms. Water vapor, if no free H_2 is present, is more efficient than N_2 in bringing atoms to the metastable level. This has been proved by measuring the absorption of the arc line 4046, which is absorbed only by the metastable atoms, and 0.005 mm. of H_2O vapor in the tube is sufficient to cause the reversal of 4046 if photographed with the large quartz Lummer-Gehrke plate, while 0.5 mm. of N_2 is necessary to do the same. G. G.

Polarization of light excited by electron impact. JOHN A. ELDRIDGE, ALEXANDER ELLETT AND HARRY F. OLSON. *Phys. Rev.* **29**, 207(1927).—The lines of the sharp subordinate series of the Hg spectrum, excited by a well-defined stream of slowly moving electrons, are in general weakly polarized; those of the diffuse subordinate series are quite strongly so. In this series the elec. vector of the excited light is perpendicular to the electron stream whenever $j = 0$ and parallel to the stream for lines involving a decrease of j. When j increases, the line is less strongly polarized and the results are not definite. The excited atoms are supposed to have their j vector in or near the plane perpendicular to the electron stream. Qualitatively the results for this series are in agreement with the concept that the atom emits a plane polarized or circularly polarized light quantum according as j remains const. or changes by one. This simple theory cannot be correct, however, as it leads to parallel polarization never greater than 33%, as contrasted to 60% observed for some lines; it also fails when applied to the somewhat weaker polarization of the other series. R. L. HERSHEY

Analysis of the first spark spectrum of sulfur (S^+). D. K. BHATTACHARYYA. *Nature* **122**, 241–2(1928).—The spectrum lines of S^+, observed by Lockyer in the constellation Rigel are probably due to the multiplets $^4P_3 - {}^4D_4$ and $^4P_3 - {}^4\bar{P}_3$ of the transition $2M_3N_1 \longleftarrow 2M_2N_2$ for the lines λ5454 and λ5033, and to the multiplets $^4\bar{D} - {}^4D$ and $^4P - {}^4\bar{P}$ of the transition $2M_2M_3 \longleftarrow 2M_2M_2$ for the groups at λ4142 – λ4174. H. F. JOHNSTONE

Polarization of infra-red radiation by calcite. A. M. TAYLOR. Cambridge. *Phil. Mag.* [7], **6**, 88–97(1928).—The expts. have shown that infra-red rays are partially polarized by transmission through thin plates of calcite cut parallel to the optic axis,

and such polarization effects have been used to det. which of the bands observed in the absorption spectrum of calcite really correspond to maxima of absorption, and which are merely spurious and due to interference effects. It is also suggested that the spectrum can be explained without assuming the inactive frequency to be active in combination (cf. *C. A.* **22**, 28). GEORGE GLOCKLER

The theory of light scattering liquids. Y. ROCARD. College de France, Paris. *Phil. Mag.* [7], **6**, 204–5(1928).—Priority claims against C. V. Raman and K. S. Krishman (cf. *C. A.* **20**, 1554; **22**, 2310). GEORGE GLOCKLER

Extreme ultra-violet spectra using large angles of incidence. J. BARTON HOAG. *Phys. Rev.* **29**, 208–9(1927).—A vacuum spectrograph was constructed with a concave speculum grating of 215.3 cm. radius and having 591 lines per mm. The Rowland mounting with the slit placed close to the grating, making the angle of incidence approx. 80°, was used. With C and Mg electrodes, spectra have been obtained from 220 A. U. to 1700 A. U. The scale varies from 3.54 A. U. per mm. at 1600 A. U. to 2.26 A. U. per mm. at 550 A. U. in the first order. R. L. HERSHEY

Excitation of spark spectrum of nitrogen. R. A. WOLFE AND O. S. DUFFENDACK. *Phys. Rev.* **29**, 209–10(1927).—The arc spectrum of N was excited in an interrupted low-voltage arc in a mixt. of He and N_2. Nearly all lines found by Merton and Pilley were verified; addnl. lines were found, some of which agree with those reported by Hardtke; others fill vacant spaces in multiplets computed by Kiess. The strength of the lines is due to a high degree of dissocn. of the N by excited He atoms present in large concn. R. L. HERSHEY

Critical potentials of spark lines of mercury. JOHN A. ELDRIDGE. *Phys. Rev.* **29**, 213(1927).—The intensities of 30 of the stronger spark lines of Hg have been measured as a function of voltage and 3 crit. values found less than 150 v. at 18, 24 and 57 v., resp. The abs. values are not certain as they may be changed by changing current d. R. L. HERSHEY

Ultra-violet radiations emitted by point discharges. JOHN THOMSON. Univ. of Glasgow. *Phil. Mag.* [7], **6**, 526–46(1928).—Preliminary expts. are described showing the variation with pressure of the ionizing and photoelec. radiations from H_2 and N_2 when the gases are excited by a discharge and the variation of the intensity of these radiations when the pressure is kept const. and the discharge current is varied. The curves obtained depend upon both absorption and emission variations, and an attempt is made to est. the relative importance of the 2 effects, and so to sep. them. Tentative explanations are offered of the various phenomena; it will be a matter for further investigation to decide between them. Reasons are put forward suggesting that the radiations are mol. in origin. A spontaneous ionization phenomenon in O_2 is described and an explanation is offered. GEORGE GLOCKLER

Resonance glow in a hydrogen-discharge tube. ROGERS D. RUSK. *Phys. Rev.* **29**, 213–4(1927).—At H_2 pressures below 0.2 mm. and potentials above the min. arcking potential a blue haze extends throughout the hot-filament discharge tube. Systematic variations of gas pressure, discharge potential, filament current and anode distance have been made to det. the nature of the glow. With fixed anode distance the glow appeared at a const. potential for pressures below 0.2 mm., at which pressure it became indistinguishable from the more common arc type of glow. The intensity of the glow and its extent are functions of gas pressure, anode distance and potential. Weakness of the Balmer lines and the effect of pressure change suggest a close relationship between the life of the excited mol. and its collision frequency. R. L. HERSHEY

New type of discharge in neon tubes. J. W. RYDE, L. JACOB AND B. S. GOSSLING. *Nature* **121**, 794(1928). H. G.

Anti-Stokes radiation of fluorescent liquids. R. W. WOOD. Johns Hopkins Univ. *Phil. Mag.* [7], **6**, 310–2(1928).—Exceptions to Stokes' law in the case of the fluorescing vapors of Na, I_2 and other elements are the rule. In the case of solns. of org. dyes it is less easy to show the phenomenon; in fact its existence was a matter of dispute for nearly a quarter of a century. So far no photographs have ever been published showing the presence of anti-Stokes radiations in the case of solns. In prepg. an article on fluorescence for the new edition of the Encyclopædia Britannica it appeared to be of interest to secure photographs establishing the reality of the phenomenon, and W. obtained such with ease. GEORGE GLOCKLER

Fluorescence of mercury vapor under low excitation. LORD RAYLEIGH. *Nature* **122**, 242(1928).—The energy required for the excitation of the green band fluorescence of Hg vapor is not as great as that of the Hg resonance line. On the contrary, it may be excited by the line λ3125 of Hg. The strong line λ3650, on the other hand, is unable to excite fluorescence. H. F. JOHNSTONE

Fluorescence spectra in metallic vapors excited by the light in the mercury arc. J. C. McLennan and I. Walerstein. *Phys. Rev.* **29**, 208(1927).—Fluorescence spectra were obtained from vapors of S, Se, Te and Bi at moderate temps. by using a Hg lamp as a source of excitation. S gave a set of bands extending over the range of the visible spectrum. Se at 325° gave a fluorescent spectrum ranging from 2200 A. U. to 6500 A. U.; at 425° it emitted a different spectrum of 9 broad bands between 4178 A. U. and 4829 A. U.; this latter spectrum disappeared at higher temps. Te gave a spectrum of regularly spaced bands in the visible region, the relative intensities of the bands varying with the pressure of the vapor. Bi gave a band spectrum between 4400 A. U. and 4900 A. U. The region of the Hg arc which excited the Te vapor to produce fluorescent radiation was between 2536 A. U and 3655 A. U. R. L. Hershey

Fluorescence and chemiluminescence of cod-liver oil. Jay W. Woodrow and G. M. Wissink. Iowa State College. *Phys. Rev.* **29**, 219(1927).—Cod-liver oil will produce a developable image on a photographic emulsion, an effect which is more pronounced if the oil has been exposed to ultra-violet light. A chemiluminescence is obtainable by oxidation of the treated vapor; the color is bluish green, but too faint for spectroscopic analysis. The fluorescent spectrum of cod-liver oil illuminated by the light from a quartz Hg-vapor arc has a max. intensity at a wave length of 5000 A. U. The color of the fluorescent light, as observed by the eye, appears to be the same as that produced by chemiluminescence. R. L. Hershey

Active nitrogen. C. N. Hinshelwood. *Nature* **122**, 404–7(1928).—A review. E. H.

Active nitrogen. Joseph Kaplan and Gunther Cario. *Nature* **121**, 906–7 (1928).—Metastable mols. of N are present in active N, but its long life cannot be explained on this hypothesis. Its behavior suggests that active N is at , and that metastable mols. are formed under the influence of the recombination of N atoms to mols. It is necessary also to assume the formation of metastable atoms under these conditions; these excite, by collisions of the second kind, the metastable mols. to the upper level of the first positive band. The metastable mols. appear to be quenched by heating, and the metastable atoms undisturbed. The absence of absorption in active N from 3000 A. U. to 6500 A. U. may be accounted for on this basis. W. T. R.

The afterglow in mixtures of nitrogen and oxygen. Bernard Lewis. Univ. of Minn. *Nature* **122**, 241(1928); cf. Kaplan, *C. A.* **22**, 2323, 2887.—Different types of afterglow may be excited in the same mixt. of N and O at the same pressure merely by altering the period of the discharge. At 0.53 mm. pressure in air, a $^1/_2$ sec. discharge gives rise to a blue afterglow, while an instantaneous discharge leaves a yellowish green afterglow. At a pressure where the transition from the yellowish green to the blue commences ($^1/_2$ sec. discharges being used) the former is displaced as a wave along the tubing leading from the discharge vessel while the latter glow occupies the vessel itself. H. F. Johnstone

Notes on active nitrogen. Arthur Edw. Ruark. Mellon Inst. *Phil. Mag.* [7], **6**, 335–6(1928).—Okubo and Hamada obtained certain spectra of metal vapors in active N_2 (*C. A.* **22**, 1730). R. compares his work (*C. A.* **21**, 1062) with theirs and discusses the discrepancies. George Glockler

The electrical conductivity of aqueous solutions of radon. Ellen Gleditsch and Liv Gleditsch. Inst. de Chim. de L'Univ. Oslo. *J. chim. phys.* **25**, 290–3(1928).—Small quantities of dissolved Rn, from 13.7×10^{-9} to 235×10^{-9} curies per cc., were found to have no influence on the cond. of the solns. E. G. VandenBosche

General theory of the photochemical reactions of the halogens. Jh. Cathala. *J. chim. phys.* **25**, 182–215(1928).—In all photochem. reactions of the halogens there is first a dissocn. of the mol. into neutral atoms. Thus for Cl_2 there is: $Cl_2 + h\nu = 2Cl$. Cl atoms may then unite with mols. to form chlorozone according to: $Cl + Cl_2 = Cl_3$. These reactions account for the rapid disappearance of Cl atoms in the gaseous phase. C. assumes the synthesis of phosgene to take place as follows: $Cl_3 + CO = COCl_2 + Cl$. The neg. catalytic effect of O_2 is due to the reaction: $Cl + O_2 = ClO_2$, which decreases the concn. of Cl_3. For the synthesis of HCl, C. assumes the reaction: $Cl_3 + H_2 = 2HCl + Cl$. In the formation of HBr ($Br_3 + H_2 = 2HBr + Br$) I_2 is a neg. catalyst by reason of the reaction: $Br_3 + I = BrI + Br_2$. On the other hand it is a pos. catalyst in the formation of HCl because of the formation of stable ICl, which reacts as follows: $ICl + Cl_2 = ICl_3$ and $ICl_3 + H_2 = ICl + 2HCl$. The catalytic effect of H_2O vapor in the synthesis of HCl is probably due to an electrostatic influence, drawing the mols. of H_2 and Cl_2 closer together, thus increasing the ease with which the electrons of the H_2 mol. can be sepd. On the other hand H_2O is not necessary for

the synthesis of $COCl_2$, since CO is already an "incomplete" mol. in a chem. sense.
E. G. VANDENBOSCHE

An interpretation of the chemical actions of radiation. P. VILLARD. *Compt. rend.* **186,** 1669–73(1928); cf. *C. A.* **22,** 1288.—Hypotheses of V. and Belliot (*C. A.* **22,** 921) on the antagonistic action of radiations on a photographic plate are presented and contrasted. The outstanding facts to explain are as follows: (1) Impressions produced by different frequencies (optical and x-rays) have not the same properties; (2) 2 images of high and low frequency may co-exist, and hence either one can be developed selectively; (3) in consequence of the independence of 2 impressions it is possible to solarize a plate to optical but not necessarily to x-ray frequencies. Plates fogged by high frequencies, *e. g.*, x-rays, can be restored to sensitivity to these same ν's by treatment with white light. Likewise the sensitivity of plates to violet light, previously destroyed by exposing to red light, may be restored. Such expts. indicate roughly the upper limit of the "regenerating" quantum necessary. V. supposes that at. levels assocd. with these reactions can be reconstituted by electronic agitation by wave lengths possessing quanta not quite large enough to draw from these levels the electrons which tend to return to them.
H. R. MOORE

Hydrogen activated by the electric discharge. A. DE HEMPTINNE. *Bull. sci. acad. roy. Belg.* **14,** 8–17(1928); cf. *C. A.* **22,** 2878.—H was subjected to a 400-v. d. c. discharge of 0.72×10^{-5} amp. and allowed to react with metallic oxides. The pressure was varied from 3.6 to 0.45 mm. of Hg. As the pressure is decreased the amt. of reduction increases. PbO_2 and HgO are rapidly reduced—PbO and CuO slowly. NiO is not reduced. The action is greater when the electrode nearer the oxide is neg. At const. pressure the amt. of PbO_2 reduced decreases with decreasing current and with the distance of the oxide from the electrode. This indicates that the action in this case is due largely to ions. Other expts. were made with the oxide in contact with one of the electrodes and with the use of a grid of the same polarity as the oxide. The ratio of the no. of H mols. which react to the no. of ions corresponding to the coulombs of electricity used was detd. The ratio is much greater when the grid is used than when it is disconnected. This is attributed to a preponderance of neutral H in the at., tri-at. or excited mol. state.
J. E. SNYDER

The influence of light on the color of ferric chloride solution. KENNETH S. RITCHIE. Stanford Univ. *J. Phys. Chem.* **32,** 1269–71(1928).—Exposure to intense radiation produces a photochem. change in the 3-component system H_2O–HCl–$FeCl_3$. The change is reversible and the solns. return slowly to their initial condition after the light is removed. Spectrocolorimeter measurements show that the absorption of light over various parts of the spectrum increases as the radiation is continued. The change is similar to that produced on heating the soln. and is probably due to hydrolysis.
R. E. GIBSON

X-ray coloration of kunzite and hiddenite. P. L. BAYLEY. Univ. of Rochester. *Phys. Rev.* **29,** 353(1927).—Absorption curves were obtained before and after exposure from 2000 to 300μ for pink kunzite and yellow green hiddenite. Kunzite had one weak wide absorption band at 540mμ. Bands were found for hiddenite at 1670, 1000, 630, 438, 432, 378 and 368mμ. X-ray treatment produced in hiddenite slight increase in absorption below 440mμ. Both minerals were colored very similarly—kunzite slightly more bluish green. In kunzite new brands occurred at 910 and 625mμ. Radiated kunzite showed no bands below 500mμ. It is suggested that the green color in both minerals is due to a similar physical cause.
L. D. R.

The Fermi-Dirac hypothesis of gas degeneration and its applications. E. S. BIELER. McGill Univ., Montreal. *J. Franklin Inst.* **206,** 65–82(1928). W. T. RICHARDS

Electric resistance of metals as a function of pressure. A. T. WATERMAN. Yale Univ. *Phys. Rev.* **29,** 368(1927).—That the pressure coeff. of resistance $(1/R)(dR/dP)$ is given by $(C/2) + (RT/2)\ (dx/dp + \delta v)$ is indicated from the influence of pressure on resistance, involving the effect of pressure on chem. equil. postulated between ions, atoms and electrons within the metal. C = compressibility, x = energy liberating electrons within the metal, δv = vol. change. The change in resistance due to pressure is due to a change in the mean potential energy of the free electrons. For elements in the same group, the rate of change with vol. of the mean potential energies of both the bound and free electrons is approx. a linear function of the at. no.
L. D. R.

The action of light on diazo derivatives (SEYEWETZ, MOUNIER) 10. Spectrocomparator (STANLEY) 1. Se cells as colorimeters (MICKWITZ) 2. A goniometer for measuring crystals in ordinary and x-ray light (VASIL'EV) 1. A microphotometer for comparative measurements of density on x-radiogram spots (VASIL'EV) 1. A

camera for obtaining oriented Lauegrams (Vasil'ev) **1**. Registering photodensitometer (Harrington) **1**. The influence of temperature on the photosensory latent period (Hecht) **11**. The relation of time, intensity and wave length in the photosensory system of *Pholas* (Hecht) **11**. Artificial daylight (Walsh) **4**.

4—ELECTROCHEMISTRY

COLIN G. FINK

Electrochemical products emphasize interdependence of processes and industries. C. L. Mantell. *Chem. & Met. Eng.* **35**, 486–8(1928).—Electrochem. industries are divided into groups representing the electrolytic, the fused electrolyte and the electrothermic. Unit processes and the interdependence of electrochem. industries are featured. A discussion is included of conditions existing in industries mfg. Cl, Al, Al_2O_3, graphite, CaC_2, CS_2, P, steels, etc. Technology and its importance in future developments of electrochem. industries are stressed. A. D. Spillman

A home-made electric laboratory furnace. St. Reiner. *Chem.-Ztg.* **52**, 579 (1928).—The furnace is cheap and reliable with an upper temp. limit of about 2000°. It is made of fire brick; the dimensions are 60·26·38 cm. The bricks are cut out with a hammer to fit the 10 cm. diam. fireclay tube, the interstices being filled with fire brick cement. The tube in the heating room is completely covered by cryptol. The sheet metal lid is cut out to permit the passage of 2 C electrodes, which reach down into the cryptol material. A resistance of running water is used; the furnace consumes a max. of about 100 amp.; electrodes and cryptol have to be changed from time to time. R. D. Bumbacher

Power factor in high-frequency spark induction furnaces. R. Dufour. *J. Phys. Radium* [vi], **8**, 508–21(1927).—A study of the schematic function of the furnace is made based on certain hypotheses which enable a math. treatment of the subject to be developed from which the time of charge of the condensers, the number of charges per sec., the intensities of the current and heat liberated at the end of the charge or discharge, and eventually the power factors are calcd. successively. The variation of the power factor with the tension of the spark, and the relation of the no. of wave-trains per sec. to the phase-angle, are also derived. B. C. A.

Review of conditions leading up to electrolytic practice (zinc). H. R. Hanley. *Metal Ind.* (London) **33**, 135–6, 152(1928).—The essential factors making the electrolytic Zn process practical are: (1) improvement in grade of concentrate; (2) economic power; (3) dependable and economic methods of purification; and (4) organization. Characteristics of Tri-States concentrate are: (1) the Zn in the calcine is 97–8% sol. in dil. H_2SO_4; (2) there is only a trace of Fe in soln. and if As or Sb develops by repeated cycles some Fe would have to be added to the soln.; (3) the settling of the neutral pulp and the filtration of the acid mud are reasonably satisfactory; (4) the complete removal of Cd is standard practice; and (5) Co can be economically handled if necessary. General plant procedure is outlined. The acid balance of the process is realized when the acid generated in the cells is equal to that demanded by the calcine for the soln. of the ZnO in residues and purification products. Probably 3500–3600 kw.-hrs./ton (909 kg.) of bar Zn is a reasonable est. of all power, mech. and electrolytic. W. H. B.

Nature of the deposit formed during the electrolysis of neutral and alkaline solu-
tions with an antimony cathode. Julius Grant.   John Cass Tech. Inst. (London).
J. Chem. Soc. **1928**, 1987–8; cf. *C. A.* **19**, 2310; **21**, 1919.—A substance previously sup-
posed to be Sb_2H_2 is formed (1) by the electrolysis of NaOH (0.05–3*N*) solns., (2) by
the electrolysis of solns. contg. suspended metallic Sb or its compds. with a Pb cathode,
(3) by reduction of Sb compds. with nascent H. Conclusion: This substance is rather
metallic Sb in a finely divided state, contg. a small trace of adsorbed H. C. J. B.

The chromium facing of photo-engraved surfaces. E. A. Ollard. *Metal Ind.*
(London) **33**, 129–31(1928).—The principal points in the operation of a Cr-plating
soln. are outlined. The necessary plant consists of the generator, the vat and the
arrangements necessary for removal of fumes and regulation of temp. For facing
cylinders, it must be rotated in the vat at a speed (usually about 20 r. p. m.) permitting
a satisfactory deposit. It is probably best to treat half-tone plates and surfaces re-
quired to take the ink in cold soln. with dull deposit, while the photogravure cylinders
from the surface of which the ink is to be removed are best treated in warm soln. with
a bright deposit. The proportion of sulfate to CrO_3 is important. A good soln. for
face printing plates contains: 500 g. CrO_3/l., 7.5 g. castor sugar is added, the soln.
warmed, and the sugar added a little at a time to prevent undue frothing. The soln.

is boiled 1 hr. and allowed to cool. For a dull soln. 2 cc/1. of H_2SO_4 are added and for a bright soln. about twice as much. Pumice powder and a little cyanide are used for scouring half-tone plates, while vienna replaces pumice in bright finish surfaces. The total sulfate may be estd. by reducing a sample with EtOH in the presence of HCl and pptg. with $BaCl_2$. The sp. conductance being proportional to the degree of reduction can be used to det. whether the soln. has become over-reduced. Excessive sulfate may be eliminated by the addn. of $BaCrO_4$. Cr is harder than Ni, is not easily corrodible, adheres well to Cu, and has slight tendency to form pits. Cr may be stripped from Cu by immersion in dil. HCl permitting the removal of faulty or worn plates, and replating of the surface. W. H. BOYNTON

A lead-mercurous iodide voltaic cell. WARREN C. VOSBURGH. State Univ. of Iowa and Eppley Lab. *J. Am. Chem. Soc.* **50**, 2386–94(1928).—The following cells were measured at 25° and at 5° intervals between 20° and 40°: Pb(Hg) | PbI_2 + x *M*-KI | x *M* KI + PbI_2 + Hg_2I_2 | Hg. Pb(Hg) | PbI_2 + CdI_2 (satd.) | CdI_2 (satd.) + PbI_2 + Hg_2I_2 | Hg Cd(Hg) | CdI_2 (satd.) | CdI_2 (satd.) + Hg_2I_2 | Hg. The e. m. f. of the first 2 was found to be $E_t = 0.31748 + 0.000129 (t - 25)$ v. The e. m. f. of the third was found to be $E_t = 0.41702 + 0.000360 (t - 25)$ v. From the e. m. f. results the free energy and entropy changes and heats of reaction for the corresponding reactions were calcd From the latter and a reliable value for the heat of formation of PbI_2 the heats of formation of Hg_2I_2 and CdI_2 were calcd. to be 2 Hg (1) + I_2 (s) = Hg_2I_2 (s); $\Delta H_{25} = -28939$ cal. Cd (s) + I_2 (s) = CdI_2 (s); $\Delta H_{25} = -48918$ cal. E. R. SMITH

The photogalvanic cell furnished with silver iodide electrodes, and its application to photometry and illuminometry. SATOYASU IIMORI AND TOSHIMASA TAKEBE. *Sci. Papers, Inst. Phys. Chem. Research* **8**, 131–60(1928).—The cell studied consists of a glass trough coated on the outside with tin-foil, except for the cell-window through which light may pass, having a cover of cork or ebonite. The electrolyte is a soln. of KI and the electrodes, consisting of Ag plate whose surfaces are previously converted to AgI, are placed one behind the other at the back of the window. When the cell is exposed to light a reversible photochem. reaction characteristic of AgI occurs on the light side of the one electrode and the other remains unchanged, so that there is a photo-elec. e. m. f. between the two. The max. e. m. f. (π_m) attains a const. value after several min.; it varies with the concn. of the soln., temp. and size of the window. The rise of π_m on illumination is given by $\pi_m = a \log E - b$, where a and b are cell consts. and E is the luminous intensity. The cell can be used as a photometer or to record varying illuminations The sensitivity of the cell is low towards red light, better towards ultra-violet rays and is most effective for wave lengths between 400 and 500$\mu\mu$ for visible rays. E. G. VANDEN BOSCHE

The consecutive reactions entered into by the lead of the storage battery. WOLFGANG SEITH. Univ. Freiburg. *Z. Eletrochem.* **34**, 362–3(1928).—The course of the charge and discharge reactions in the lead storage battery have been followed in a cell contg. a pos. plate of ordinary Pb, with a neg. plate of radioactive Pb (Ra D). Th B was also used. The migration of the Pb ions was found by analyzing for the radioactive Pb. C. J. BROCKMAN

Production and application of high voltages in the laboratory. G. BREIT AND M. A. TUVE. *Nature* **121**, 535–6(1928).—A method of producing and measuring voltages up to 5 × 10^6 v. is described; high voltages are applied to vacua by the use of external electrodes. B. C. A.

Artificial daylight. J. W. T. WALSH. *J. Sci. Instr.* **5**, 81–8(1928).—The uses of artificial daylight and means for its production are discussed. Artificial daylight having the same spectral distribution as true daylight is distinguished from "sensation" daylight in which the same visual effect is produced by means of a different spectral distribution. The former only can be used for matching colors, while the latter is permissible for general illumination. The only practical method of producing artificial daylight is the subtractive method, in which the excess of red and yellow light is removed by an absorbing screen, or by reflection from a colored surface. Its production is therefore less efficient than that of ordinary artificial light. B. C. A.

Moisture in oils used in the electrotechnic industry. The approximate determination of their moisture content (MATTHIS) 22. Electrolytic Cr plating of glass molds and cylinder materials (ILLIO) 19. Metal protection in galvanizing technic (KRAUSE) 9. Removal of arsenic from H_2SO_4 (Russ. pat. 1514) 18. Metal coating (Can. pat. 283,034) 9. Improving cloth through a galvanic metallic precipitate (Ger. pat. 451,963) 25. Electric glass furnace (Norw. pat. 44,661) 19.

Storage battery. R. Bosch A.-G. Brit. 283,490, Jan. 11, 1927. Structural features.

Electric battery assembly. Berliner Batterie-Fabrik Ges. Brit. 283,856, Jan. 17, 1927. Structural features.

Seals for dry cells. Paul A. Marsal (to Can. National Carbon Co., Ltd.). Can. 282,684, Aug. 21, 1928. A seal for dry cells is obtained by applying a thin coating of nitrocellulose lacquers (as a soln. of pyroxylin in an ether-alc. mixt., or a soln. of an ether-sol. cellulose deriv. such as cellulose acetate or cellulose ethers in a suitable solvent) to the mix body of the cell, and an additional seal as rosin, sealing wax, pitch may then be applied if desired.

Electrolytic cells. Norsk Hydro-Elektrisk Kvaelstofaktieselskab. Norw. 43,571 and 43,572, Dec. 27, 1927. Cells for electrolytic processes particularly water decompn. are molded from a mass consisting of an asphalt compn. having a sp. gr. about equal to that of the electrolyte. Suitable compns. are (1) 990 kg. petroleum pitch m. above 130° + 10 kg. asbestos, (2) 670 kg. petroleum pitch + 330 kg. $BaSO_4$ powder, (3) 670 kg. petroleum pitch + 330 kg. $BaSO_4$ + 10 kg. asbestos fiber. The cell is assembled with electrodes and diaphragms which are kept in place by means of suitable diaphragms of a stiff material, for instance sheet metal, which are dissolved by a suitable chem. reagent, for instance the electrolyte itself, after the molding of the cell container has been accomplished.

Electrolyte for electric batteries. F. A. Macziossek (to Frigamin Ges.). Brit. 283,559, Jan. 14, 1927. An electrolyte for either wet or dry cell batteries, especially those of the Leclanche type, contains methylamine-HCl or other suitable hydrochloride of an org. amine. Org. acids such as cinnamic acid, sulfo acids or phenols or their suitable derivs. may be added to neutralize any hydroxides which may be formed. Acids which can be hydrogenated under the influence of a catalyst may be used and Hg can be used as a catalyst and to amalgamate the sol. electrode.

Barometric device for replenishing liquid in electrolytic cells. Walter E. Holland (to Philadelphia Storage Battery Co.). U. S. 1,684,276, Sept. 11. A device is specified suitable for use with storage batteries.

Recovering distilled water from gases produced in electrolytic cells. C. F. Holmboe. Norw. 44,685, Dec. 19, 1927. The gases, particularly H_2 and O_2 from H_2O decompn. cells, are passed through a condenser where the H_2O is recovered and afterwards through a washing app. where other impurities such as traces of alkalies, etc., from the electrolyte are removed by washing with cold water. The process is carried out under increased pressure.

Electrolytic rectifier. E. W. Engle (to Fansteel Products Co.). Brit. 283,208, Jan. 7, 1927. See U. S. 1,680,210 (*C A* **22**, 3591).

Electrolytic rectifier. M. E. MacGregor. Brit. 284,039, Nov. 4, 1926. The cathode of an electrolytic rectifier is made of "stainless" steel such as Cr steel and the electrolyte consists of citric acid or NH_4 citrate, to which ferrous, ferric or Al salts may be added, or of a mixt. of NH_4 Al phosphocitrate and ferrochromium oxalate. Various structural features are described.

Electrolytic rectifier. Soc. anon. pour l'exploitation des procédés E. Urbain (to Soc. Anon. des etablissements veuve P. Delafon et Cie). Brit. 283,953, Jan. 21, 1927. The acid electrolyte used as described in Brit. 272,921 (*C. A.* **22**, 1736) is replaced by an alk. or neutral soln. together with a Si-contg. electrode.

Elements for rectifiers of alternating current. J. Slepian (to Metropolitan-Vickers Electrical Co., Ltd.). Brit. 283,901, Jan. 19, 1927. Cu disks may be heated to between 500° and the m. p. of Cu in an oxidizing atm. until a layer of Cu_2O surrounded by a layer of CuO is formed on the metal. The disks may then be mounted in pairs on a cond. arbor in a bath contg. an electrolyte such as dil. H_2SO_4, NaOH, KF or NH_4-ClO_3 soln. with graphite electrodes on insulating collars between each pair of disks. Various other details are also given. Cf. *C. A.* **22**, 2518.

Chromium plating. Kevie W. Schwartz (to Chromium Products Corp. to Chromium Corp. of America, to United Chromium Incorporated). Can. 282,730, Aug. 21, 1928. Metallic Cr is deposited from a bath contg. 415 g. of commercial CrO_3, 12 g. commercial Cr $(OH)_3$, and 21 g of neutral commercial Cr sulfate per l. Electrolysis is performed with Cr, or Fe-Cr anodes at 40–45°; a voltage of 4.5 to 6 is satisfactory. The c. d. at the cathode ranges from 0.15 to 0.175 amp. per sq. cm.

Plating with chromium. John Merle Hosdowich (to The Metal and Thermit Corp., to Chromium Products Corp., to Chromium Corp. of America, to United Chromium, Inc.). Can. 282,540, Aug 14, 1928. An electrolytic bath contg. 325 g. of CrO_3 dissolved in the necessary vol. of H_2O is heated to boiling and into the hot soln. 12 g.

$Cr(OH)_3$ is stirred. Six g. $FeSO_4.7H_2O$ is added to the soln. The whole mixt. is dild. to 1 l. and is ready for electrolysis. The best temp. for electrolysis is between 35° and 45°; a suitable potential is 2.5 to 5 v. with current density of 0.05 to 0.2 amp. per sq. cm.

Aluminum. I. G. Farbenind. A.-G. Brit. 283,949, Jan. 21, 1927. In producing Al by electrolysis of a fused bath contg. alumina, the alumina is introduced in calcined form after having been treated to increase its d. by grinding under pressure as described in Brit. 272,109 (*C. A.* **22,** 1638).

Aluminum. Ture R. Haglund (to International Patent Corp.). Can. 283,424, Sept. 18, 1928. Al is produced from Al_2O_3 by electrolysis of a molten electrolyte contg. Al_2O_3, by supplying crystd. Al_2O_3 and amorphous Al_2O_3 to the electrolytic bath, the quantity of added amorphous Al_2O_3 amounting to about 10–40% of the total wt. of the added Al_2O_3.

Steel. Robert A. Hadfield. U. S. 1,683,886, Sept. 11. In order to produce flawless Ni-Cr steel low in S and P, molten refined base metal and materials such as Ni and ferro-chrome are heated in a basic elec. furnace in the presence of deoxidizing material such as C and ferro-Si and of suitable basic slag-forming material including lime, and the treated metal is afterward subjected to the action of a deoxidizing and refining slag to reduce the quantity of S and P in the metal to the desired limits.

Steel. Soc. anon. fonderia Milanese di acciaio. Brit. 283,489, Jan. 10, 1927. Molten cast iron prepd. in a cupola furnace by melting iron, steel or cast iron scrap is charged into an elec. furnace where it is mixed with Fe oxide and treated in the usual way. Two or more elec. furnaces may be used alternately.

Electrothermic production of zinc. Robert Lepsöe. Norw. 44,244, July 25, 1927. The reduction and distn. process is carried out in 2 sep. steps. As the first step a part of the charge is heated to the reaction temp. and the reduced and evapd. Zn is condensed in cooler parts of the charge while CO escapes. The second and final reduction and evapn. of the Zn is carried out in the same or in another elec. furnace.

Electrothermic production of zinc. F. Tharaldsen. Norw. 44,021, May 16, 1927. The temp. in the condenser is controlled by regulating the temp. of the liquid zinc bath in the condenser box, the most favorable temp. of the Zn bath being 470–530°.

Electrode for electrolysis of water. Nordiske Fabrikker De-No-Fa and C. F. Holmboe. Norw. 43,902, April 4, 1927. Structural features.

Self-burning electrodes. Det Norske Aktieselskab for Elektrokemisk Industri. Norw. 43,079, Dec. 27, 1927. The electrode is provided with inlays consisting of pieces of suitable form made from coal or graphite electrode mass and burned before the insertion. These inlay pieces are inserted in the girth of the electrode with projecting noses to which the elec. current contacts are connected, these connections being attached to inlay pieces which have the desired distance above the surface of the smelting bath.

Use of self-burning electrodes. Det Norske Aktieselskab for Elektrokemisk Industri. Norw. 44,673, Dec. 5, 1927. Mech. features of design and operation.

Distant manipulation of self-burning electrodes. Det Norske Aktieselskab for Elektrokemisk Industri. Norw. 44,461, Oct. 10, 1927. Mech. features.

Reducing the voltage loss in electrodes in metallurgical furnaces. Det Norske Aktieselskab for Elektrokemisk Industri. Norw. 44,736, Jan 9, 1928. Mech. and elec. features regarding the introduction of the elec. current into the electrode body.

Electric induction furnace. Hirsch, Kupfer- und Messingwerke A.-G. Brit. 283,886, Jan. 19, 1927. Structural features.

Electric induction pressure or vacuum furnace. Edwin F. Northrup (to Ajax Electrothermic Corp.). U. S. 1,683,986, Sept. 11.

Electrothermic furnace and process. Norsk Handels- og Industrilaboratorium A. S. Norw. 44,276, Aug. 1, 1927. A rotary cylindric furnace has several pairs of electrodes. The ends of some of them are covered, and of some not covered by the charge. In this way the heat is produced by resistance effect between the pairs of electrodes with the ends covered by the charge and by arc effect between the others.

Condenser for electrothermic zinc furnace. Aktieselskapet Malmindustri. Norw. 44,763, Jan. 16, 1928. The cross-sectional area of the condenser decreases in the direction of the moving of the zinc vapors in correspondence with the reduction of the vol. of the gas caused by the condensation. The cooling of the condenser is effected wholly or partially by steam.

Aluminum furnace. Peder E. Froland. Can. 282,967, Sept. 4, 1928. An elec. furnace having a particular form of carbon bottom and cathode connection is specified.

Dry reduction of iron ore in electric resistance furnaces. NORSK HYDRO-ELEKTRISK KVAELSTOFAKTIESELSKAB. Norw. 44,705, Jan. 2, 1928. The resistance elements, usually consisting of iron wire spirals, are protected against oxidation by introducing all or part of the fresh reduction gas into the furnace in such a way that the resistance elements are completely surrounded by such gas.

Carrying out chemical gas reactions in the electric arc. NORSK HYDRO-ELEKTRISK KVAELSTOFAKTIESELSKAB. Norw. 44,180, July 4, 1927. A long, stable, high-voltage arc burns in an elec. field which is independent of the working current, one electrode of the elec. field being the elec. arc itself and the other the surrounding pipe.

Treating hydrocarbons with the silent discharge. SIEMENS AND HALSKE A.-G. (Wilhelm Esmarch, inventor). Ger. 463,643, July 12, 1928. High-frequency a. c. (above 5000 cycles) is used in a water-cooled app.

Application of long, stable, high-voltage electric arcs. AKTIESELSKAPET NORSK STAAL. Norw. 43,971, May 2, 1927. An addn. to Norw. 43,570. (*C. A.* **21**, 2106.) A bath of molten metal is used for the hot electrode instead of a bath of fused refractory oxides. The metal bath is, however, covered with a relatively thin layer of fused refractory oxides or salts or a mixt. of such substances.

Compounds containing active oxygen. I. G. FARBENINDUSTRIE A.-G. (Erich Noack, Oswin Nitzschke and Georg Pfleiderer, inventors). German 463,794, July 19, 1928. Amalgamated cathodes in electrolytic prepn. of these compds. are renewed by wetting with Hg at short intervals or continuously or by electrolytic pptn. of Hg.

Removal of chlorine ions from metalliferous liquors or similar solutions. SIEMENS AND HALSKE A.-G. Ger. 452,088, Nov. 2, 1927. The purpose is to remove the chlorine ions from baths used for electrodeposition of metals. For example H_2SO_4 baths do not deteriorate Pb anodes when the circuit is broken but the Pb will deteriorate if Cl ions are present. This is accomplished by placing a Ag anode in the bath sepd. by a diaphragm so that the whole electrolyte streams through the diaphragm sepg. the anode chamber from the cathode chamber. A proportion of Ag corresponding to the Cl in the electrolyte is dissolved and forms AgCl, as a flocculent, easily filterable ppt. The liquor is filtered and reused.

Carbon filaments. ANTON LEDERER. Can. 282,800, Aug. 28, 1928. Carbon filaments for incandescent elec. lamps are manufd. by mixing substantially pure C in a finely divided state with a water-sol. salt contg. an oxide of iron (as ammonium iron nitrate, ammonium ferric sulfate and potassium ferric sulfate), heating and powdering the mixt., adding an oleic soap as a binder to form a plastic mass, squirting the plastic mass into filament form, and heating to at least 2500° in an atm. of substantially pure argon.

Thermionic filament cathodes. RADIOTECHNIQUE. Brit. 283,967, Jan. 21, 1927. Various structural details of filaments (which may have oxide coatings) are specified, which are suitable for use by direct heating with a. c. without "hum."

Filament for electric incandescent lamps. PATENT-TREUHAND-GES. FÜR ELEKTRISCHE GLÜHLAMPEN (to General Electric Co., Ltd.). Brit. 283,848, Jan. 17, 1927. Filaments of the closely wound type for high- power lamps are roughened over all or a part of their surface in such a manner that the black-body radiation so obtained is maintained during the useful life of the lamp. The roughening may be effected by sandblasting, or by chem. or electrolytic action. The filaments must be at least "several tenths of a mm." in diam.

5—PHOTOGRAPHY

C. E. K. MEES

A new photographic effect. FRITZ WEIGERT. *Naturwissenschaften* **16**, 613–4 (1928).—Clear AgCl-gelatin plates irradiated with linearly polarized light and physically developed give a dichroitic and doubly refractive silver deposit of optical axis parallel to the elec. vector of the light. The expts. were made with printing-out emulsions of Valenta type, thoroughly washed after prepn.; com. plates are too coarse-grained and allow depolarization. The effect is produced by white, blue or ultra-violet light. A very sensitive dichrometer method did not show any dichroism in a long-exposed, undeveloped sensitive film; the directly formed latent photosilver is therefore isotropic. It is thus evident that the customary theory of the photographic process, beginning with latent nuclei, may have to be revised. B. J. C. VAN DER HOEVEN

Collection of recipes for use in the photographic and reproduction arts. C. FLECK. *Sprechsaal* **61**, 163(1928).—Recipes are given for pickling solns. for different kinds of

metals, baths and lacquers for decalcomania, and other solns. and gelatins for use in these arts. R. A. HEINDL

Rate of desilverization of the wet collodion silver bath. B. P. O'SHAUGHNESSY. *Phot. J* 68, 123–7(1928).—Process workers use a hydrometer to measure the Ag content and thus the degree of exhaustion of their sensitizing bath. Check volumetric titrations show that the actual exhaustion after bathing many plates is not so great as that shown by the hydrometer. The differences in sp. gravities of the waste reaction products account for the discrepancy. K. C. D. HICKMAN

Peculiar reversal of the discharge figures on photographic plates. USABURO YOSHIDA AND JINZO TSUTSUMI *Mem. College Sci. Kyoto Imp. Univ.* 11, 267–70(1928).—A peculiar reversal of the discharge figures on photographic plates, which is caused by fogging the plate with a spark light simultaneously with the impression of the discharge figures, is described (cf. F. E. Nipher, *Trans. Acad. Sci. St. Louis* 10, 151–66(1900)). The wave length of the fogging light which is effective in this respect is shorter than about 420 mμ. This reversal is not caused by a simultaneous illumination of the photographic plates with two illuminations of short duration. E. P. WIGHTMAN

The study of traces of metal in paper. R. E. LIESEGANG. *Z. wiss. Mikroskop.* 45, 179–82(1928).—Paper for photographic purposes is tested for specks of Fe or bronze by coating first with the following reagent: 3 cc. alc. and 3 cc. 50% $AgNO_3$ soln., mixed and added to 400 cc. of a 2% collodion soln. This coating is allowed to dry a few hrs., and a second coating of 12% gelatin soln. is applied and dried thoroughly. On standing for a few days, local reduction of the $AgNO_3$ indicates the position of the metal specks. It is possible to strip the reagent coating from the paper, which may then be tested further. The method may be modified for testing emulsions on photographic papers. C. W. MASON

The light sensitivity of dyes. A. STEIGMANN. *Kolloid-Z.* 44, 326–9(1928); cf. *C. A.* 22, 2887.—A discussion is given of the effect on exposure of Ag halide grains produced by light-sensitive dyes. The hydrogenation theory of optical sensitizing is still very important. A method of hypersensitizing without NH_3 is given by which bathing in 0.5% $AgNO_3$ 2 min., then in a 3.0% NaCl bath and finally treatment with a pinachrome sensitizer is carried out. Such a pre-treatment of a coarse-grained negative emulsion optically sensitized with erythrosin also sensitizes. The sensitivity specks must act catalytically. NH_3 causes these specks to become more active. R. H. L.

Study of moving flames (PAYMAN) 24. Registering photodensitometer (HARRINGTON) 1. An interpretation of the chemical actions of radiation (VILLARD) 3.

Color photography. W. T. TARBIN. Brit. 283,765, Feb. 1, 1927. In exposing superposed layers sensitized for different colors simultaneously, the layer sensitive to the blue end of the spectrum is located during exposure farthest from the source of light and may comprise a high-speed bromide emulsion. The composite material may include stripping films and may, *e. g.*, be formed with a red-sensitive stripping layer on glass, a blue-sensitive layer on glass, and a green-sensitive non-stripping layer on thin celluloid enclosed between the layers supported by glass. Certain of the layers may be dyed to act as light filters, and various details are given.

Films for color photography. H. HORST (to Sirius Kleuren Film Maatschappij). Brit. 283,548, Jan. 13, 1927. The film consists of an emulsion layer, a carrier such as a celluloid compn. or the like, an opaque layer and a second emulsion layer, in the order named. The opaque layer may be colored with Mn peroxide or by a non-actinic dye sol. in the developing and fixing baths.

Color cinematography. R. GSCHÖPF. Brit. 283,560, Jan. 15, 1927. Negative records may be taken simultaneously on adjacent film strips one of which is sensitized for yellow-green with pinaflavol and the other for red with pinachrome-blue or pinacyanol-blue, in a camera with reflectors and a rotating multi-color filter, and these negatives are printed in register on opposite sides of a film sensitized on both sides and the images suitably dyed and mordanted by a method various details of which are described.

Photographic films embossed with lenticular elements on the side not coated with emulsion. G. CHRÉTIEN (to Soc. technique d'optique et de photographie). Brit. 283,954, Jan. 22, 1927. Mech. and optical features.

Photographic printing. RUDOLF FRITSCHE. Can. 283,344, Sept. 18, 1928. A soln. for treating wet blue-print paper to turn it green consists of $UO_2(NO_3)_2$ 1 oz., $K_3Fe(CN)_6$ 1 oz., AcOH 10 oz., H_2O 200 oz.

6—INORGANIC CHEMISTRY

A. R. MIDDLETON

Valency. IX. Molecular structure of thallium salts. (a) Thallium triiodide; (b) alkyl derivatives. ARTHUR J. BERRY, THOS. M. LOWRY, (MRS.) R. R. GOLDSTEIN AND F. L. GILBERT. Cambridge Univ. *J. Chem. Soc.* **1928**, 1748–68; cf. *C. A.* **22**, 1899.—TlI_3 was examd. in order to det. whether it should be regarded as thallic iodide or thallous polyiodide. Solns. in MeOH and acetonitrile form addn. compds. with pyridine and chloropyridines, and complex ions with KI, and exhibit the general reactions of a thallic salt, but the reactions of thallous ions could not be detected with certainty. The *absorption spectrum of TlI_3* in MeOH shows 2 maxima sepd. by 1400 A. U. while those of KI_3 are sepd by only 650 A. U. The spectrum is not that of a triodide ion, nor can the compd. be a simple aggregate of Tl^{+++} and I^-, since these ions are colorless and do not give rise to absorption bands. The iodide is, therefore, a tervalent compd., in which part of the halogen is linked directly to the metal. The mol. conductivities of Tl trihalides in MeOH and in acetonitrile are less than those of KI. The salts behave only as binary electrolytes, in which some of the halogen is linked to metal, even in the most dil. alc. solns. *Dimethylthallonium iodide* is hydrolyzed in dil. aq. solns. and is derived from a base much weaker than TlOH. The mol. cond. of *$TlBr_3$* is less than that of a binary electrolyte, except in dil. aq. solns. where it is hydrolyzed progressively. Hg and Tl are evidently related in the same way as C and N.

G. L. CLARK

The irreversible dehydration of some hydrated crystalline salts. A. RACOUSINE. *Bull. soc. chim.* **43**, 744–7(1928).—Borax, heated to 98°, quickly forms the stable pentahydrate, which on standing in the air absorbs but a small trace of H_2O. The monohydrate, formed by heating the salt to 200°, is likewise stable. The anhyd. salt, obtained by heating to 340°, absorbs H_2O somewhat more readily. Glauber's salt changes to the stable anhyd. salt after being exposed to the air for about 6 days and the process is not reversible. $Na_2CO_3.10H_2O$ changes to $Na_2CO_3.2H_2O$ in the air; the anhyd. salt is formed by heating it to 98°. On exposure to the air, the anhyd. salt forms the stable monohydrate.

F. G. VANDENBOSCHE

Advances in the chemistry of fluorine. OTTO RUFF. *Z. angew. Chem.* **41**, 737–40(1928).

E. H.

The chemistry of ruthenium. F. KRAUSS. *Z. angew. Chem.* **41**, 413–8(1928).—A review with bibliography of 93 references.

E. H.

Scandium and rare earths. P. B. SARKAR. *Ann. chim.* [x], **8**, 207–62(1927).—By a critical examn. of the data available in the literature and by the prepn. of a no. of new simple and complex salts of Sc an attempt is made to det. the analogies which exist between the compds. of this element and those of other tervalent elements, the Fe and the rare-earth groups, resp. From the point of view of the soly. of its salts Sc resembles in general the elements of the rare earths, but it also exhibits many close analogies with the Fe group in the cryst. form and compn. of many of its complex salts. Thus the acetylacetonates of Sc are isomorphous with those of Fe, and the double alkali sulfates with those of Al, while it forms a series of double alkali sulfates corresponding with the anhyd. alums which are quite unknown in the rare-earth series; its basic nitrates closely resemble those of Cr. Spectroscopic evidence obtained using a very pure sample purified by the sublimation of Sc acetylacetonate confirms its relationship with the Al family. No such intimate relationship is found. however, between the simple salts of Sc and those of either the rare-earth or Fe group of elements, Sc occupying a transitional position between the 2 groups. The following new salts of [illegible] $)_6.4H_2O$ of [illegible] H_4, Rb and [illegible]

sulfate, $Sc_2(SO_4)_3$, suggests that it is really Sc scandisulfate, $Sc[Sc(SO_4)_3]$; K Sc *selenate*, $KSc(SO_4)_2.2H_2O$; *basic nitrates* of compn. $Sc(OH)(NO_3)_2.3H_2O$ [erroneously described by Crookes (*C. A.* **2**, 2193) as the anhyd. normal nitrate], $Sc_2O(NO_3)_4.0.5H_2O$ (stable between 90° and 115°), and $Sc_4O_5(NO_3)_2$ (stable between 120° and 200°). $Sc(OH)_3$ forms a crimson lake with NH_4 aurintricarboxylate (Hammett and Sottery, *C. A.* **19**, 796), which, unlike the corresponding Al lake, is very sol. in $(NH_4)_2CO_3$ soln., the sensitivity of the test being of the order of 2.4×10^{-7} g.-atom of Sc per cc. (cf. Corey and Rogers, *C. A.* **21**, 870). A similar study of various new salts of Gd and Eu shows that these elements resemble both the Ce and Yt groups of the rare-earth elements and form a transition between the two groups. The following new salts of Gd are described:

formate; hydrogen tartrate $+2H_2O$; *normal tartrate* $+5H_2O$; *citrate* $+5H_2O$ and $+4H_2O$; *acetylacetonate* $+3H_2O$, m. 143.5–145°; nitrate $+6H_2O$, m. in sealed tube, 91° (not $6.5H_2O$, as described by Benedicks (*Z. anorg. allgem. Chem.* **22**, 393–421); *basic nitrate*, $3Gd_2O_3.4N_2O_5.3H_2O$; *antipyrine additive* compd. of the nitrate, $Gd(NO_3)_3.3C_{11}H_{12}ON_2$; *hexamethylenetetramine additive* compd. of the nitrate $Gd(NO_3)_3.2C_6H_{12}N_4.10H_2O$; *bromate* $+9H_2O$, m. 80°; *thiocyanate* $+7H_2O$; double *salt* with $Hg(CN)_2$, $Gd(SCN)_3.3HgCN_2.12H_2O$; *orthophosphate* $+5.5H_2O$; *iodate* $+5.5H_2O$; *perchlorate* $+8H_2O$; *periodate* $+4H_2O$; *chlorate* $+10H_2O$; *double K oxalate*, $K_2C_2O_4.KGd(C_2O_4)_2.4H_2O$; *double carbonates* of the type $M_2CO_3.Gd_2(CO_3)_3.nH_2O$ of *K* $+12H_2O$, NH_4 $+4H_2O$, and Na $+13H_2O$; salts with *K ferrocyanide*, $KGdFe(CN)_6.5H_2O$; *ferricyanide* $+4.5H_2O$; *sulfite* $+12H_2O$ and $+11H_2O$; *double K chromates*, $K_2CrO_4.Gd_2(CrO_4)_3.7H_2O$ and $5K_2CrO_4.2Gd_2(CrO_4)_3.10H_2O$. The following new salts of Eu are described: *oxalate* $+10H_2O$ and $+5H_2O$; *nitrate* $+6H_2O$, m. in sealed tube, 85°; *citrate* $+5H_2O$; *hydrogen tartrate* $+2H_2O$; normal *tartrate* $+5H_2O$; *acetylacetonate* $+3H_2O$, m. 136–137°; *acetate* $+4H_2O$ and $+3H_2O$; *iodate* $+5.5H_2O$; *cyanoplatinates* $+21H_2O$, $+18H_2O$, and $+H_2O$; *carbonate* $+3H_2O$; *double K oxalate* $+2H_2O$; *orthophosphate* $+4H_2O$. B. C. A.

Pseudo-ternary systems containing sulfur. III. The system sulfur–sulfur monochloride. Dalziel L. Hammick and Michael Zvegintzov. Oxford Univ. *J. Chem. Soc.* **1928**, 1785–91; cf. *C. A.* **21**, 2089.—Discordant views are held as to the possibility of subchloride formation in $S\text{-}S_2Cl_2$ mixts. H. and Z. seek direct phase-rule evidence from a detailed study of solid-liquid equilibria, and det. the *soly. curve of S in* S_2Cl_2 under conditions favoring only S and also the temps. at which these solns. are in equil. with solid after having been heated to various temps. until internal equil. has been reached and then chilled. A new compd., S_4Cl_2, seems to be clearly established. G. L. Clark

The action of nitrogen on manganese. G. Valensi. *Compt. rend.* **187**, 376–8 (1928).—Pyrophoric Mn, obtained by distn. of its amalgam, absorbs, when heated in pure N at 760 mm., amts. of N which are a function of the temp. They decrease from 15.5 g. N per 100 g Mn at 390° to 6 g. at 1030°. This explains the no. of formulas of nitrides of Mn so far proposed—Mn_3N_2, Mn_5N_2 and Mn_7N_2. The dissociation of the product richest in N was studied at diff. temps. The system of isotherms obtained is in some respects very like the Cr-N system previously studied by V. (*C. A.* **22**, 3817). The curves represent either solns. of N in Mn or, rather, solns. of a nitride. The true formula of the nitride is still unknown, but it is richer in N than is Mn_3N_2. Higher pressures would be necessary for its prepn.; up to 1.5 atm. V. obtained no positive results. Louise Kelley

The oxidation of ferrous hydroxides in air. Alfons Krause. Univ. Posen. *Z. anorg. allgem. Chem.* **174**, 145–60(1928).—Solns. of $FeSO_4.7H_2O$ are pptd. with NaOH, the quantity of NaOH being varied so that the ratio $FeSO_4/NaOH$ ranges from 1/0.25 to 1/8. The ppt. is filtered, washed free of SO_4 and allowed to dry and oxidize in the air. Detn. of Fe^{++} and Fe^{+++} in the dry residue shows that the oxidation of $Fe(OH)_2$ is dependent upon $[H^+]$ in the soln. from which it is pptd. With the ratio $FeSO_4/NaOH$ equal to 1 or more, complete oxidation to ferric oxide hydrate occurs, while when this ratio is less than 1, the final oxidation product always contains Fe^{++}. The relation of FeO/Fe_2O_3 in the product, however, never exceeds $\frac{0.3}{1.0}$. As the quantity of Fe^{++} increases the color of the oxidized mass changes gradually from yellow to nearly black. Detns. of p_H showed that where this is 5.2 or less in the soln. from which $Fe(OH)_2$ is pptd., the final oxidation product is the positively charged meta-Fe_2O_3.aq. If the acidity is increased to $p_H = 3.5$, a ppt. is thrown down which oxidizes in the air to a compd. contg. SO_3 in which the ratio $Fe_2O_3/SO_3 = 3.57/1.0$, while if the acidity is increased to $p_H = 0.3$, $FeSO_4$ crystallizes from this soln. and no oxidation occurs. If $MgSO_4$ is added to the soln. of $FeSO_4$ in the proportion of 1:1, the ppt. on oxidation is found to be magnesium ferrite, Mg having entirely displaced Fe. The brown ortho-Fe_2O_3.aq. (isoelec. point $p_H = 7.7$) is less stable than the meta-compd., gradually changing to the meta-compd. under H_2O. The meta-compd. peptizes in dil. AcOH as well as in dil. NH_4OH, and is insol. in glacial AcOH, in which the ortho-compd. is sol. The existence of 2 series of ferric oxides or oxide hydrates, crystallographically different, is indicated. H. S.

The composition and behavior of ferric sulfide. F. Feigl and E. Backer. Univ. Wien. *Z. anal. Chem.* **74**, 393–8(1928).—For a long time the existence of Fe_2S_3 was doubted and although its existence is admitted today it is a fact that its chem. behavior is somewhat anomalous. Sometimes it reacts as if FeS were present and the explanation that this is due to the reducing power of H_2S when an acid is added is not altogether

satisfactory. Thus when neutral $HgCl_2$ in satd. NaCl soln. is treated with Fe_2S_3, HgS is formed and the soln. contains Fe^{++} whereas with $Zn(OH)_2$, ZnS and $Fe(OH)_3$ are obtained. Moreover, when Fe_2S_3 is formed by adding $(NH_4)_2S$ to $Fe(OH)_3$ the ppt. appears to be Fe_2S_3 whereas when it is formed by adding $(NH_4)_2S$ to an ammoniacal tartrate soln contg. tervalent Fe, the ppt. is $Fe_2S_3.(NH_4)_2S$. The explanation for these differences is not yet clear. W. T. H.

The preparation and properties of pure phosphorus trioxide. CHRISTINA C. MILLER. Univ. of Edinburgh. *J. Chem Soc.* **1928**, 1847-62.—A study of the rate of absorption of O by P_2O_3 in the presence of water vapor at various pressures indicates that the luminescence of the oxide is connected with the presence of dissolved P. When prepd. by Thorpe and Tutton's method P_2O_3 always contains P, which may be removed by low-temp. recrystns. from CS_2 followed by exposure to light and volatilization. The pure oxide melts at 23.8°, or 1.4° higher than the unpurified product, and it does not glow nor oxidize in moist or dry O_2 as it does if P is again added. The P_2O_3 dissolves 1.7 g. P per 100 g. at 25°. G. L. CLARK

Cyanogen compounds of the platinum metals. III. Cyanogen compounds of osmium. F. KRAUSS AND G. SCHRADER. Braunschweig Tech. Hochschule. *J. prakt. Chem.* **119**, 279-86(1928); cf *C. A.* **22**, 3367.—The compd., $K_4[Os(CN)_6].3H_2O$, (I) is prepd. by interaction of KCN and K osmiate. It is white, cryst., sol. in H_2O, and is a deriv. of bivalent Os. Characteristic ppts. are formed with heavy metal ions. $Cu_2[Os(CN)_6].xH_2O$ (II) is formed by action of $CuSO_4$ soln. upon I, and is a flocculent, yellowish brown ppt., which cannot be dehydrated without decompn If II is dissolved in concd. NH_4OH and evapd., a dark green microcryst. powder is formed, $Cu_2[Os(CN)_6].4NH_3$. It is stable in the air and is quite similar to the corresponding Ru salt. $Ni_2[Os(CN)_6].xH_2O$ is prepd. in a similar manner to the Cu salt. It is bright blue, unattacked by acids and nearly so by alkalies. With NH_4OH it forms the compd., $Ni_2[Os(CN)_6].6NH_3$, cryst., violet blue in color. It slowly loses NH_3 in the air. If the free acid is prepd from I, and a soln. of strychnine phosphate added drop by drop until no more ppt. is formed, the compd. on filtering, washing and drying gives small white crystals of the compn., $[C_{21}H_{22}O_2N_2H_2][H_2Os(CN)_6]$. An Os cyanide of the first order is not obtained nor is it possible to prep. by oxidation double cyanides with a higher valency than 2. H. STOERTZ

Investigations on silicates. E. CHERBULIEZ AND P. ROSENBERG. Univ. de Genève. *Helv. Chim. Acta* **11**, 731-50(1928).—A study of the cond. will detect and record the reactions taking place in the silicates at high temp. Silicates of the orthoclase or leucite types begin to dissociate at about 800°, *i. e.*, below their m. p.; SiO_2 is formed, together with a silicate poor in silica, probably of the nephelite type. This reaction is detected by an increase of the cond. at const. temp.; it is monomol. and reversible. An equil. exists between silicates of the orthoclase, albite, leucite type on the one side and SiO_2 + a silicate of the nephelite type on the other side. An increase of the temp. favors this second phase. It has been exptly found that a mixt. of nephelite and quartz heated at 900-1000° presents a decrease of its cond. at const. temp. This proves that the mixt. is reacting in the opposite direction, forming a silicate of the orthoclase type. A. L. HENNE

Constitution of the silicates. W. WAHL. *Z. Krist.* **66**, 33-72(1927).—Structural formulas are derived for complex alkali aluminosilicates having an equal no. of Al and alkali metal atoms on the assumption of a complex univalent anion of which the central Al atom is quadrivalent. More complex anions are formed by the union of SiO_3 or Si_2O_5 groups In those compds. having a fewer no. of Al than alkali atoms certain of the former are regarded as sexavalent, the complex anions being then tervalent. Similar types of formulas are proposed for the alk. earth aluminosilicates. Compds. contg. H are in many cases regarded as acid salts, and their formulas are derived on this principle and on those given above. *Ibid* 173-90.—The structure of the additive compds. formed between aluminosilicates and inorg. salts is discussed. Natural non-aluminiferous silicates are regarded as salts of complex anions contg. sexavalent Si; more complex types of anions are produced by the linking of SiO_3 groups by O chains. Minerals of the pyroxene, amphibole and mellilite groups are formulated on the hypothesis of bridge formation by SiO_3 groups and O atoms. The structure and mode of polymerization of the complex silicates are surveyed in the light of their infra-red absorption spectra. B. C. A.

Constitution of aluminosilicates, conditions of their formation, and transformation in soil. W. WAHL. *Finska Kemistsamfundets Medd.* **36**, 22-61(1927); cf. preceding abstract.—In those silicates which are formed at high temps. Al has a coördination no. 4, while for those formed at low temps. it tends to be 6. Formulas with 2 Al atoms

are improbable; in the cryst. state the aluminosilicates are highly polymerized. The
reactions leading to the formation of minerals in the magma consist of (*a*) dehydration
processes and (*b*) additive reactions; the effect of these processes is traced in the for-
mation of hornblende and muscovite. The formation of biotite is summarized as follows:
(i) $6K[Al^{IV}O(SiO_3)] + 12H_2O = K_6H_{12}[Al_6^{VI}O_6(OH)_{12}(SiO_3)_6]$, (ii) $6Mg_2SiO_4 + 12H_2O$
$= 6MgSiO_2(OH)_2 + 6Mg(OH)_2$, (iii) $K_6H_{12}[Al_6^{VI}O_6(OH)_{12}(SiO_3)_6] + 6MgSiO_2(OH)_2 =$
$K_6H_{12}[Al_6^{VI}O_6(SiO_3)_6(MgSiO_4)_6] + 12H_2O$, (iv) $(K,H)_6H_{12}[Al_6^{VI}O_6(SiO_3)_6(MgSiO_4)_6] +$
$6Mg(OH)_2 = (K\,H)_6Mg_6[Al_6^{VI}O_6(SiO_3)_6(MgSiO_4)_6] + 12H_2O$. B. C. A.

A study of uranyl sulfate. A. Colani. *Bull. soc. chim.* **43**, 754–62(1928).—
By crystg. UO_2SO_4 from mixts. of H_2O and H_2SO_4 at 25° a no. of salts were obtained,
the formation of which was essentially dependent on the concn. of H_2SO_4. The solid
phases were dried *in vacuo* and weighed. The following compds. were found: UO_2SO_4.-
$3H_2O$, $UO_2SO_4.2H_2O$, $(UO_2SO_4)_2.H_2SO_4.5H_2O$, $UO_2SO_4.H_2SO_4.2H_2O$ and $UO_2SO_4.H_2SO_4$.-
$0.5H_2O$. The systems $UO_2SO_4.H_2O$ and $(NH_4)_2SO_4$, K_2SO_4 and Na_2SO_4 were likewise
studied at 25°. E. G. VandenBosche

Higher polythionates. A. Kurtenacker and A. Czernotzky. Tech. Hoch-
schule, Brünn. *Z. anorg. allgem. Chem.* **174**, 179–88(1928).—If 75–200 cc. of cold concd.
HCl is added to a soln. of 125 g. $Na_2S_2O_3$ in 130–150 cc. H_2O to which has also been
added 8–20 cc. of *N* Na_2HAsO_3, polythionates are formed. If the av. S content *n* of
the polythionates formed, $S_nO_6^{++}$, is detd by the sulfite and cyanide methods, it is
seen that the higher the HCl concn. the greater is *n*. Relatively pure pentathionate
is obtained when the ratio $\frac{\text{mol. HCl}}{\text{mol. } S_2O_3}$ is equal to 1.8. If this ratio is about 5, then about
equal parts of pentathionate and hexathionate are formed. If the solns. obtained
are concd. the value of *n* rises. The mechanics of the formation of higher polythionates
from lower ones is as follows: $S_5O_6^{++} + S_2O_3^{++} + H^+ \rightleftharpoons S_6O_6 + SO_3H$. If the acid
concn. is low, this equil. tends to go to the left while if it is high it goes to the right.
Raschig's Na_2CO_3 method for pentathionate detn. is rejected, as only a fraction of the
S_5O_6 is decompd. according to the equation $S_5O_6 = S + S_4O_6$. S_4O_6 is decompd. in alk.
soln. H. Stoertz

Sodium ethylene thiosulfate, $Na_2C_2H_4S_4O_6$. O. Yu. Magidson and V. M. Krol.
Trans. sci. chem. pharm. inst. (Moscow) **6**, 21–8(1923).—When ethylene dibromide
and satd. aq. Na thiosulfate are stirred for 10–15 days at 40°, plates of *Na ethylene
thiosulfate*, $Na_2C_2H_4S_4O_6$, decompg. when heated, are obtained. B. C. A.

Mercuri-tetrammine persulfate. Fr. Fichter and Salomon Stern. Anstalt
für anorg. Chemie, Basel. *Helv. Chim. Acta* **11**, 754–8(1928).—Criticism of N. Tarugi
(*Gazz. chim. ital.* **33**, 127(1903)) and Gmelin-Kraut-Friedheim (*Handbuch der anorg.
Chemie* V, II, 613–4). The salt described as $Hg^INH_4S_2O_8 + 2NH_3$ is really a Hg^{II}
compd. A const. wt. of NH_3 is obtained only after drying in an NH_3 atm. The true
formula is $[Hg(NH_3)_4]S_2O_8$. The hydrolysis gives a mixt. of basic salts, with no definite
compn., but no salt of the $HgNH_4SO_5$ type. A. L. Henne

**Hexamino- and pentaminoaquo complex salts of tervalent cobalt and chromium
crystallizing in the cubic system.** O. Hassel and G. Bödtker Naess. Univ. of Oslo.
Z. anorg. allgem. Chem. **174**, 24–30(1928).—The following compds. are prepd. by methods
already described: $[Co(NH_3)_6]SO_4I$ (I), $[Co(NH_3)_5H_2O]SO_4I$ (II), $[Co(NH_3)_6]SO_4Br$
(III) and $[Co(NH_3)_5H_2O]SO_4Br$ (IV). Optical investigation indicates strong anomalous
double refraction for the luteobromide sulfate, the other prepns. being optically isotropic.
X-ray examn. shows a face-centered cubic translation group leading to a structure like
that of *fluorspar* in which the Ca has been replaced by the complex cation, one F by the
SO_4 group and the other by Br or I. The 2 iodide sulfates are identical as are also the
bromide sulfates. This is confirmed by analysis. $[Co(NH_3)_6]SeO_4I$ (V) is prepd. in
the same manner as I except that $(NH_4)_2SeO_4$ is used in place of the sulfate. In appear-
ance this cannot be distinguished from I, but its Debye diagram gives a somewhat
higher lattice const. The bromide selenate is prepd. by adding dil. H_2SeO_4 to a warm
soln. of III. It seps. as long tetragonal prisms and optically shows rhombic symmetry.
By pptn. of a soln. of $[Co(NH_3)_6]Br_3$ with a soln. of $(NH_4)_2CrO_4$ fine needles of quadratic
cross section sep.; they have the formula $[Co(NH_3)_6]CrO_4Br.3H_2O$. They are identical
with the corresponding selenate and sulfate. $Co(NH_3)_6CrO_4I$ is prepd. by treating
$CoCO_3$ with an excess of H_2CrO_4, followed by neutralization with NH_4OH after CO_2
has been evolved, and subsequent treatment with I. An analogous series can be prepd.
from this compd. by using the other halogens or replacing Co with Cr. The cubic
structure is always obtained. In an effort to prep. analogous Mo compds. $CoCO_3$
and MoO_3 are digested with H_2O until all CO_2 is driven off, concd. NH_4OH and I are
added and the digestion is continued for 1 hr. It is filtered hot, a red compd. being

left on the filter which on analysis is found to be $2[Co(NH_3)_6]_2(MoO_4)_3.3H_2O$. On cooling the filtrate a golden brown, very sol. cryst. compd. seps., $Co(NH_3)_6MoO_4I$. The crystals, however, are not cubic and give an x-ray diagram different from the analogous SO_4 and SeO_4 compds. Failure to obtain the fluorspar structure is explained as due to the magnitude of the MoO_4 ion. The perchlorates, $[Co(NH_3)_6](ClO_4)_3$ (VI), $[Co(NH_3)_5H_2O](ClO_4)_3$ (VII), $[Cr(NH_3)_6](ClO_4)_3$ (VIII) and $[Cr(NH_3)_5H_2O](ClO_4)_3$ (IX) are prepd. All show symmetrical cubic crystal structure. VII is deep red in color, VIII yellow and IX bright red. VI is prepd. by action of $HClO_4$ upon the corresponding chloride followed by crystn. VII and IX are prepd. by action of moist Ag_2O upon $[Co(NH_3)_5Cl]Cl_2$ (X) or the corresponding Cr compd., followed by neutralization of the base with $HClO_4$. VIII is prepd. by action of $HClO_4$ upon the corresponding nitrate. $[Co(NH_3)_5H_2O]SO_4ClO_3$ is prepd. by action of Ag_2O upon X followed by neutralization of the sol. base thus formed with a soln. of $HClO_3$ contg. H_2SO_4. Beautifully formed, optically isotropic octahedrons sep. from soln. on evapn. They give all the reactions of the chlorates. This compd. shows the characteristic fluorspar structure. The length of the cubic edge of a few of these compds. is given as follows: I —10.71 A. U., II —10.62 A. U., III —10.51 A. U., IV —10.45 A. U., V —10.79 A. U., $[Co(NH_3)_6]SeO_4Br$ —10.63 A. U., $[Co(NH_3)_5H_2O]I_3$ —10.81 A. U., VI —11.38 A. U., VII —11.32 A. U. H. Stoertz

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Reactions in the solid condition at high temperatures (Jander) 2.

7—ANALYTICAL CHEMISTRY

W. T. HALL

Method of evaluation of analyses. I. O. Liesche. *Z. angew. Chem.* **41**, 748-50 (1928).—A systematic method is described for the calcn. of the compn. of a complicated mixt. as regards the actual simple, double or complex salts present, from the usual analytical data giving the percentages of anions and cations or basic and acidic oxides. Examples of the application of the method to analyses of ultra-marine and of a hard water are given. B. C. A.

Sampling of materials. I. General principles involved. W. R. D. Jones. *Metal Ind.* (*London*) **32**, 585-8(1928). **II. Gases and liquids.** *Ibid* 609-12. **III. Sampling of water, oil, slimes and powdered substances.** *Ibid* **33**, 3-4. **IV. Sampling of coal.** *Ibid* 27-8. **V. Sampling of ores and concentrates.** *Ibid* 125-8. **VI. Sampling of ores, metals and alloys.** *Ibid* 199-203.—An account of methods in use in various parts of the world. W. T. Hall

Sampling of granular materials. Bernhard Baule and A. Benedetti-Pichler. *Z. anal. Chem.* **74**, 442-56(1928).—By means of the laws of probability, equations are developed showing how the errors due to sampling can be computed. From these it is easy to find what wt. of sample should be taken for analysis. This is illustrated by practical examples. The application of micro-methods to the analysis of mixts. is also discussed and the formulas of Mika (*C. A.* **22**, 1926) are shown to hold true only for a special case. The original paper must be consulted for details. W. T. H.

Chemical analysis by x-rays. A. H. Turner *Chem. Eng. Mining Rev.* **20**, 361-3(1928).—A brief account of some work done with C. E. Eddy and Laby on the detection and detn. of Cu, Fe, Ge, Co, Ni, As, Pb and Bi. It is possible to detect as little as 0.0001% of these elements existing as impurities; the no. of elements which can be detected in this way is large; the method is rapid and but very little material is required to make the x-ray target. W. T. H.

Volumetric micro-analysis and centrifugo-volumetry. Robert F. Le Guyon. *Ann. chim.* **10**, 50-112(1928).—In connection with some studies on the elimination of H_3PO_4 it was necessary to analyze small quantities of urine obtained with the catheter and this led to the development of a micro-analytical method. In this present paper, to which a bibliography of some 66 papers is appended, volumetric methods applicable to the detn. of small quantities of substances are discussed. In Part I, some relatively new volumetric pptn. reactions are mentioned and their application to micro-analysis is shown. The detn. of PO_4^{---} with Ag^+ and other precipitants is discussed thoroughly; the titration of Ba^{++} with CrO_4^{--} and CrO_4^{--} titrations of Hg^{++}, Pb^{++} and Ag^+ are described. In Part II, reactions of Cl^-, SO_4^{--}, PO_4^{---}, AsO_4^{---}, CO_3^{--}, CrO_4^{--}, CNS^-, Ag^+, Pb^{++}, Hg^{++}, As^{+++}, Sb^{+++}, Sn^{++}, Bi^{+++}, Cu^{++}, Cd^{++}, Fe^{++}, Fe^{+++}, Cr^{+++}, Mn^{++}, Zn^{++}, Al^{+++}, Ba^{++}, Sr^{++} and Mg^{++} are discussed from the stand-

point of "centrifugo-volumetric methods" *i. e.*, reactions in which the persistence of color in the soln. titrated is taken as the end point and a colored ppt. is removed from the soln. quickly with the aid of the centrifuge. W. T. H.

Solubility influences and quantitative analysis. I. E. WENDEHORST. *Z. angew. Chem.* **41**, 567–8(1928).—The fact that the normally negligible solubilities of certain substances are often not inconsiderable in presence of neutral salts is responsible for a number of errors in gravimetric detns. Expts. in which known quantities of Zn and Cd were pptd. by Na_2CO_3 and $(NH_4)_2CO_3$, resp., from media contg. varying amts. of Na, K or NH_4 salts show that under these conditions the amt. of oxide finally weighed may be slightly greater, or considerably less, than the theoretical amount. B. C. A.

Nephelometric analysis using a spectrophotometer. K. JABLCZYN'SKI AND W. STANKIEWICZ. *Roczniki Chem.* **7**, 534–48(1927).—The least errors: 0.79, 1.50 and 0.53% are obtained with orange, yellow and green light, resp. The errors for red and blue light are: 2.35 and 1.98%. High angles, about 76°, give the smallest errors. $K = (\ln \lg \alpha - \ln \lg \alpha_0)/c$, where α_0 and α are the rotations with clear water and the solns. examd. and c is the concn. Expts. with $BaCl_2 + H_2SO_4$ without a protective colloid showed that K increases with the speed of stirring (*I*), the H_2SO_4 concn. (*II*) and inversely with the $BaCl_2$ (*III*). The effects of *II* and *III* are very marked. K is higher when $BaCl_2$ is poured into H_2SO_4 than when the reverse is the case. In 0.25% gelatin the effect of *I* was insignificant; *II* and *III* were still definite. One % gum arabic almost doubled K but made it independent of *I* and *II*. *III* and *IV* had a similar effect as in the absence of gum arabic With $CaCl_2 + K_2C_2O_4$ similar results were obtained. For the study of amorphous ppts. $FeCl_3$ and $AlCl_3$ were pptd., with NH_3, $CuCl_2$ and $NiCl_2$ with NaOH *Fe(OH)₃*.— In the presence of excess NH_3, *I* has little effect. K increases with the NH_3 concn. to a certain NH_3 excess, beyond which it is no longer affected K decreases very slowly with the $FeCl_3$ concn. The error is 0.2 and 6.2%. $Al(OH)_3$.—K decreases with increasing NH_3 concn. probably because of the soly. In the presence of 20% NH_4Cl the pptn. is quant. from hot (not from cold) solns. K decreases with the Al concn. Error.—1.7% without, 0.5% with NH_4Cl. Conclusion: The present nephelometric methods are entirely inadequate. Spectrophotometry with an improved technic will replace gravimetric analysis in industry. MARY JACOBSEN

Colorimetric analysis using a spectrophotometer. K. JABLCZY'NSKI AND W. STANKIEWICZ. *Roczniki Chem.* **7**, 549–58(1927).—The method and equation are the same as thos applied in the nephelometric detns. (cf. preceding abstr.). In the reaction: $FeCl_3 + 3NH_4CNS = Fe(CNS)_3 + 3NH_4Cl$, K increased rapidly with the NH_4CNS concn. even when the relation Fe:CNS reached 1:96. The hypothetical compd., $(NH_4)_9Fe(CNS)_{12}$ therefore, does not exist. The HCl concn. does not affect K when Fe:HCl = 1:6. Higher concns. lower K, the decrease being 20% for Fe:HCl = 1:512. K is also insignificantly lowered by a decrease in Fe concn. In the reaction: $CuCl_2 + 4NH_4OH = [Cu(NH_3)_4]Cl_2 + 4H_2O$ Beer's law is valid, provided the NH_3 concn. remains const. The Cu concn. has no effect on K; a 16-fold increase of the NH_3 concn. increases it by 20%. The error is 0.21%. *Fehling's soln.*—K increases slightly with the $C_4H_4O_6$ concn. up to $Cu:C_4H_4O_6$ = 1:4 and remains const. from this point on. A moderate rise of K is caused by a decrease of the Cu concn., a very marked one by an increase of the NaOH concn. The error is 0.7% for an angle of 80–85° (opt.), and 6.8% for 45°. For the reaction: $NiCl_2 + 6NH_4OH = [Ni(NH_3)_6]Cl_2 + 6H_2O$, K decreases with increasing NH_3 and with decreasing Ni concn. (No figures given). The expts. show that Beer's law does not hold true for these reactions. In order to become applicable it would have to be changed to $(c_1/c_2)^x = d_1/d_2$, where x would vary with the reaction. Colorimetry could in such cases be replaced advantageously by spectrophotometry. MARY JACOBSEN

Diphenylamine as indicator in the titration of iron with dichromate. F. J. WATSON. *Chem. Eng. Mining Review* **22**, 355–7(1928).—Because of the fact that the results obtained with students using diphenylamine as indicator were not thoroughly satisfactory, the titration was studied with diphenylamine and potentiometrically. With a sulfate soln. in which the electrometric end point occurred when 19.92 cc. of $K_2Cr_2O_7$ were added, the first change in color from the clear green of Cr^{+++} began at about 18.6 cc. and as each drop of dichromate was added the green became duller and was a very cold, gray green at about 1 drop before the electrometric end point. A purple color became distinct at the electrometric end point. In HCl solns. the color at the end point was bluer but, in the latter case, the presence of $HgCl_2$ caused tardiness in the development of the purple color and with 10 cc. of satd. $HgCl_2$ soln. 2 cc. of excess dichromate were required. Knop's arbitrary deductions of 0.05 cc. from the total dichromate used does not seem to be the correct procedure as the purple color appears at the true end point

normally When the first change in color is noticed the dichromate should be added dropwise, waiting a definite time after each addn. The indicator change is reversible; hence an over-shot end point can be back titrated but the final end point should always be the development of color with dichromate. When reducing Fe^{+++} with $SnCl_2$, add the reagent dropwise to the boiling soln. and do not add more than 2 drops in excess. Cool and add only a few drops of $HgCl_2$ soln Standardize the soln. against Mohr's salt with diphenylamine as indicator. W. T. H.

A specific reagent for silver and a new, sensitive test for silver. F. FEIGL. Univ. Wien. *Z. anal. Chem.* **74**, 380-6(1928). -Rhodanine, $C_3H_3NOS_2$, gives an insol. ppt. with Ag^+ and with Hg^{++} ions and this characteristic is retained by many rhodanine derivs., among which *p*-dimethylaminobenzylidenerhodanine is especially suitable as a sp. reagent for Ag To prep. this deriv, dissolve equimol. quantities of rhodanine and *p*-dimethylaminobenzaldehyde in glacial AcOH and heat 1 hr. under a reflux condenser. The red crystals begin to sinter at 200° and m. 246°. Dissolve 0.03 g. of the crystals in 100 cc. of acetone. Add a little of this reagent to the acid soln. to be tested and a reddish violet ppt will form if 0.001 mg. is present. The reaction is so sensitive that it is useful for a micro test. Thus, to detect Ag in a coin, rub the metal against a streak stone so that a light line is obtained. Add a drop of HNO_3 and evap. with a flame Then moisten the streak with the reagent and add a few drops of 6 *N* HNO_3. W. T. H.

Application of rapid electroanalysis by graded potentials to commercial alloys. ARNOLD LASSIEUR. *Chimie et industrie* Special No., 129-30(April, 1928); cf. *C. A* **21**, 1071.—The Lassieur method enables Sb, Cu, Bi, Pb, Sn, Cd, Zn and Ni to be sepd and detd electrolytically in the same soln., so that bronzes, brasses, solders, plating metals, bearing alloys, type metals, German silver, Al alloys, and commercial Cu, Sb, Pb and Zn can be analyzed without having to carry out any evapns., filtrations and pptns. The latter operations are required only for the detn of impurities which are present in small quantities in commercial metals. The method is in daily use in the Paris municipal labs, where it is giving satisfactory results. A. P.-C.

Quantitative spectral analysis of metallic alloys. TR. NEGRESCO. *J. chim. phys.* **25**, 343-62(1928); cf. *C. A.* **21**, 3848.—Though the intensity of spectral lines diminishes with the decreased amt of the element in the source, no law can be given for the variation To analyze an alloy by the spectral method it is first necessary to obtain the spectra of known standards of all possible compns. of the alloy and then, having obtained the spectra of the alloy in question, compare the intensities of given lines with the standards. All phys. conditions must be kept the same. Comparative tables are given for alloys of Sn-Bi, Pb-Bi, Cu-Si, Fe-Si, Cu-Co and Zn-Cd E. G. VANDENBOSCHE

Quantitative separations and determination by volatilization with hydrogen chloride. VI. Determination of oxide in aluminum alloys. G. JANDER AND W. BRÖSSE. *Z. angew Chem.* **41**, 702-4(1928). The method recently described (*C. A.* **21**, 2239) for the sepn. of Al, Si and Mg, etc., in Al alloys can be used for the accurate detn. of the Al_2O_3 present in such alloys, if not less than 0.02% is present. Under the prescribed conditions of drying, moisture is sufficiently eliminated from the gaseous HCl, and further drying by cooling to −78° to −80° with ether and solid CO_2 is unnecessary. An internal reaction temp. of about 275° is used instead of 200-220° as originally recommended. B. C. A.

Potentiometric analysis of the hardening elements in special steels. II. Determination of chromium and vanadium in iron alloys and in alloy steels. E. ZINTL AND P. ZAIMIS. *Z. angew Chem* **41**, 543-6(1928); cf. *C. A.* **22**, 556.—In the detn. of Cr and V by the author's potentiometric method, the presence of Fe is not essential. Small quantities of Mn must however, be present. W interferes with the detn. of V, but not in the presence of H_3PO_4. The sample taken for analysis (0.5-5 g., depending on the Cr and V content) is fused with 6-10 times its own weight of Na_2O_2 and, after cooling, extd. with 2 *N* NaOH. A few cc. of H_2O_2 are added to decompose manganate and ferrate, and the whole is boiled. After filtration, the filtrate, which contains the whole of the Cr, V, Mo and W as chromate, vanadate, molybdate and tungstate, resp., is diluted to an appropriate vol. A suitable aliquot is acidified with 100 cc. of 1:1 (vol.) H_2SO_4, 2-3 cc. of a dil. $MnSO_4$ soln. (120 mg. of crystals per l.) are added, and after diln. to 200 cc. the titration is effected as described. If W is present, the aliquot is treated with 30 cc. of H_3PO_4 (d 1.74) before the addn. of the H_2SO_4. The catalytic effect of the small quantity of Mn is discussed. B. C. A.

Rapid analysis of brass and bronze. M. RUDOLPH. *Chem.-Ztg.* **52**, 652(1928); K. MASL AND CH. OS. STEYRER. *Ibid.* SEUFERT. *Ibid.* Kollrepp (*C. A.* **22**, 1744)

published a method depending upon dissolving the alloy in HNO_3, removing SnO_2, pptg. Pb as $PbSO_4$, Cu as CuS, Ni as glyoxime deriv. and Zn as ZnS. The fact that the procedure of K. is unnecessarily long and troublesome and that better procedures are well known is pointed out independently in 3 letters to the editor. W. T. H.

The detection of magnesium in minerals by means of the diphenylcarbazide test. F. Feigl. Univ. Wien. *Z. anal. Chem.* **74,** 398–9(1928); cf. *C. A.* **22,** 41.—F. pointed out some time ago that the diphenylcarbazide test can be obtained with magnesite but not with dolomite. Recent x-ray studies by Halla (to be published elsewhere) show that F.'s idea that dolomite is $Ca[Mg(CO_3)_2]$ is possibly true. Similarly aragonite is very likely $CaCO_3$ and calcite is $Ca[Ca(CO_3)_2]$. W. T. H.

Notes on the determination of molybdenum. H. A. Doerner. Bur. Mines, *Information Circular* No. 6079, 2 pp.(1928).—The method, which is dissussed in U. S Bur Mines, *Bull.* **212,** depends upon dissolving the sample in aqua regia, evapg. with H_2SO_4, removing $PbSO_4$ and adding NH_4OH and 3 g. of Na_2CO_3 to the filtrate therefrom. This serves to ppt. Ca and other interfering ions. After thorough digestion the ppt. of carbonates and hydroxides is removed, tartaric acid and H_2S are added and any ppt. that forms is removed. The alk. sulfide soln. is then made acid and MoS_3 filtered off. The MoS_3 is dissolved in aqua regia and a $PbMoO_4$ ppt. is formed in a properly buffered soln. and weighed. W. T. H.

Investigations into the analytical chemistry of tantalum, columbium and their mineral associates. XII. Observations on the pyrosulfate-hydrolysis method. W. R. Schoeller and E. F. Waterhouse. Sir John Case Tech. Inst. *Analyst* **53,** 467–75(1928).—Expts. show that it is practically impossible to accomplish a satisfactory sepn. of the earth-acids from zirconia by any of the hydrolysis methods upon which so much emphasis has been placed in the past. ZrO_2 is likely to ppt. with Ta_2O_5 or Nb_2O_5 and if the acid concn. is made high enough to prevent pptn. of ZrO_2 then some of the earth-acid will remain in soln. Similarly with TiO_2 and the further complication arises that Zr tends to prevent the complete pptn. of TiO_2 by hydrolysis and of the earth-acids when Ti is present. The sepn. of the earth-acids from $Fe_2(SO_4)_3$ by hydrolytic pptn is also not feasible; the sepn. from $FeSO_4$ is better but by no means ideal. As the knowledge of the earth-acids becomes more complete, the idea of pptg. them by hydrolysis falls into disuse. W. T. H.

New precipitation method for the determination of vanadium and its application to steel analysis. B. S. Evans and S. G. Clarke. *Analyst* **53,** 475–86(1928).—In alk. citrate soln. of tervalent Fe salt, a reducing agent, such as $Na_2S_2O_4$, together with KCN converts Fe^{+++} completely into ferrocyanide from which the usual reactions of Fe cations cannot be obtained. If V is present at the same time, vanadyl ferrocyanide, a pale yellow gelatinous ppt. of somewhat uncertain compn., is formed on making the soln acid. This ppt. is remarkably insol. in mineral acid solns. of fairly high concn. Thus a few mg. of V can be completely pptd. by $K_4Fe(CN)_6$. *To det. V in steel,* treat 5 g. of sample in a 750-cc. Erlenmeyer flask with 80 cc. of 4.5 *N* H_2SO_4, eventually adding about 5 cc. of concd. HNO_3 to clear up the carbonaceous residue and digesting long enough to produce pure yellow WO_3 if W is present. Add 70 cc. of 50% citric acid soln and enough of hot concd. Na_2CO_3 soln. to make the soln. *faintly* alk. to litmus paper but avoiding an excess. If Ni is present it must be removed. For this purpose, add 100 cc. of a 1% soln. of dimethylglyoxime in hot alc. and filter off the Ni ppt. after it has been allowed to form during 15 min. in a warm place. (If more than 4–5% of Ni is present, more glyoxime must be used.) If the Ni is not removed, an unfiltrable ppt. of Ni ferrocyanide will be obtained subsequently. After removing the Ni glyoxime, cool the soln. somewhat, add 25 g. of $Na_2S_2O_4$ and 40–45 g. of KCN dissolved in 100 cc. of water. Dissolve the KCN in the water by gently heating, but not boiling, and allow the soln. to cool somewhat before adding it to the main soln. to which the sulfite has just been added. Shake the contents of the flask after adding the cyanide until the sulfite has all dissolved. A rise of temp. will take place in the soln. and the color will begin to fade. (The presence of Ni causes the red color to persist and when Cr is present, the pure ferrocyanide color is never obtained.) Heat the soln. for about 10 min. just below the b. p. To make sure that all of the Fe has been converted into ferrocyanide, take a few cc. of soln. in a small beaker and make it acid with H_2SO_4; if a Prussian blue color is obtained the conversion is incomplete and the soln. must be heated longer, adding more KCN if necessary. Usually a light brown ppt. of Mn ferrocyanide forms during the conversion of the Fe to ferrocyanide; this ppt. should not be removed because it will contain V. Allow the soln. to cool to about 30°, make neutral to litmus with 9 *N* H_2SO_4 and add 70 cc. of the acid in excess Allow to stand at least 2 hrs., add filter paper pulp and filter. Wash the ppt. with 2% NH_4NO_3 soln., disturbing

the ppt. as little as possible. Ignite the ppt in a Pt dish and fuse with Na_3PO_4 and 5 times as much $KNaCO_3$. Extract the melt with hot water, filter, wash with dil. Na_3PO_4 soln. and acidify the filtrate with 9 *N* H_2SO_4, adding about 5% in excess. Add a few pieces of unglazed porcelain, sat. with SO_2, boil off the excess and titrate the hot reduced soln. with $KMnO_4$. For the detn. of very small quantities of V in steel, proceed as outlined above, but filter off WO_3 if present. Then, after the conversion to ferrocyanide, add 150–200 cc. of H_2SO_4 in excess instead of 70 cc. After the fusion, conc. the extract to about 60 cc., cool, add 20 cc. of concd. H_2SO_4 and a few drops of dil. $KMnO_4$ to make sure that the V is all in the quinquevalent condition. Transfer to a Nessler tube and det. the V colorimetrically by the H_2O_2 reaction. If Mo is present, add 10 g. of NaF before pptg. the V ferrocyanide and finally remove Mo in the usual way with H_2S before detg. V. colorimetrically. W. T. H.

Determination of minute amounts of mercury. A. STOCK AND W. ZIMMERMANN. *Z. angew. Chem.* **41**, 546–8(1928).—A method for the detn. of quantities of Hg of the order $10^{-3} - 5 \times 10^{-5}$ mg. and for the detection of amts. of the order 7×10^{-6} mg. is described. The initial stages are similar to those already described (*C. A.* **20**, 2297, 3144), save that deposition on a Cu wire is effected in evacuated app. and at 50–60°. The sublimate obtained on distn. is dissolved in 0.25 cc. of chlorine water and excess of Cl expelled by air. The soln. is treated with a drop of a cold, satd. soln. of carbamide and diluted to 0.5 cc. in the cell of a microcolorimeter. The blue color produced on addn. of a drop of a satd., alc. soln. of diphenylcarbazone is observed in a darkened room by yellow light. Comparative tests are made with solns. of pure $HgCl_2$ under identical conditions. B. C. A.

Determination of ammonia. K. TÄUFEL AND C. WAGNER. *Z. angew. Chem.* **41**, 285–7(1928).—The details of manipulation and of the precautions to be taken in the detn. of small quantities of NH_3, in presence of nitrogenous materials readily decompd. with formation of NH_3, are discussed for the methods of blowing through large quantities of air and of distg. with excess of MgO. In the latter method low results are obtained if the soln. to be distd. contains considerable Mg salt. B. C. A.

A simplified method for the determination of carbon dioxide, ammonia and hydrogen sulfide in the air of dwelling rooms. K. SÜPFLE, P. HOFMANN AND L. WALZ. *Arch. Hyg.* **98**, 147–57(1927).—Concordant results were obtained when the air was passed through 25 cc. 0.1 *N* H_2SO_4 in a round-bottom flask, then through a $CaCl_2$ tube, next over bits of pumice (previously soaked in hot concd $CuSO_4$ and dried at 150–160°) and finally through a KOH bulb The gain in wt. of the H_2SO_4 showed the NH_3 content, of the pumice-$AuSO_4$ tube the H_2S, and of the KOH bulb the CO_2. P. Y. J.

Titrimetric determination of germanic acid. Studies on some hydrates formed of this acid and of its salts. ARAKEL TCHAKIRIAN. *Compt. rend.* **187**, 229–31(1928).—Ten g. of GeO_2 will dissolve in 1 l. of water contg. 20 g. of mannitol. In the presence of the mannitol, the soln can be titrated with NaOH toward which it reacts as a monobasic acid with phenolphthalein as indicator. If 20 g. of $CaCl_2$ or $SrCl_2$ is added to 10 cc. of the GeO_2 soln., it then reacts as a dibasic acid. Ge can also be titrated iodometrically. If the aq. soln. is allowed to act upon a mixt. of KI and KIO_3, at the end of 3 hrs 1 atom of I will be formed from each atom of Ge. In the presence of strong electrolytes, and at the end of 12 hrs., one mol. of I_2 is liberated. This permits the titration of Ge in the presence of strong acids. First, the strong acid is eliminated by treatment with KI and KIO_3 and the soln. is carefully decolorized with $Na_2S_2O_3$. Then after adding mannitol and allowing the soln. to stand 3 hrs. the Ge is titrated indirectly with thiosulfate. When GeO_2 is dissolved in water, the satd. soln. contains 0.8% of Ge probably present as H_2GeO_3. After mannitol has been added, an acid $H_2Ge_2M_nO_5$, is probably formed in which *M* represents a mol. of mannitol and the subscript *n* is 8 or more. In the presence of a strong electrolyte, the formation of $H_2CaGeCl_2O_3$ is postulated. W. T. H.

Notes on the detection of phosphate and molybdate. F. FEIGL. Univ. Vienna. *Z. anal. Chem.* **74**, 386–92(1928).—Yellow $(NH_4)_3PO_4.12MoO_3$ moistened with benzidine acetate soln. and brought in contact with NH_3 gives a deep blue coloration. The test is so sensitive that it responds to filter paper through which a molybdate soln. contg. so little PO_4^{---} has been passed, that there is no visible sign of a yellow ppt. Moreover, the corresponding AsO_4^{---} compd. reacts so slowly with benzidine that traces of PO_4^{---} can be detected in the presence of considerable AsO_4^{---}. The test can be used as a spot test or 2 cc. of the soln. can be treated with 3 drops of acid molybdate soln. and some satd. benzidine acetate soln. and 1% NH_3 added until a permanent turbidity is formed; a blue coloration will be obtained if 0.00066 mg. of P_2O_5 is present. There seems to be no indication in the literature that when $C_2O_4^{--}$ is present it requires

more MoO_4^{--} to give the characteristic test for PO_4^{---} than is normally necessary. It is also true that the presence of MoO_4^{--} tends to make the usual tests for $C_2O_4^{--}$ less sensitive. This indicates the formation of a complex oxalate-molybdate ion.

W. T. H.

A new and sensitive method for the detection of sulfides and thiosulfates. F. Feigl. Univ. Wien. *Z. anal. Chem.* **74**, 369–76(1928).—Raschig, in 1915, pointed out that solns. of NaN_3 and I_2 do not react together by themselves but evolve N_2 when a little $Na_2S_2O_3$ or Na_2S is added. The reaction is so sensitive that it responds to as little as 0.002 mg. of H_2S and can be obtained with insol. sulfides. Solid CuS reacts more slowly than HgS. To carry out the test, treat about 0.05 g. of the powd. substance with 5 cc. of a mixt. of equal parts 0.1 *N* NaN_3 and 0.1 *N* I_2 soln. The reaction is not obtained with free S, sulfates, selenides, tellurides, arsenides or antimonides and, in the absence of thiosulfate or thiocyanate (the last may be regarded as a sulfide), appears to be one of the most sensitive as well as most characteristic tests ever suggested for the sulfide ion.

W. T. H.

Iodometric determination of persulfates. Alfred Schwicker. Chem. Lande-inst. Budapest. *Z. anal. Chem.* **74**, 433–41(1928).—Mondolfo (*Chem.-Ztg.* **23**, 699) heated $K_2S_2O_8$ 5–10 min. with KI soln. and titrated the liberated I_2 with $Na_2S_2O_3$. If the amt. of KI is increased to 4 g. for 0.2 g. $K_2S_2O_8$ in 10 cc. of water, the reaction requires only 10 min. at room temp. The most convenient way to prepare 100 cc. of 0.1 *N* I_2 soln. is to dissolve 1.352 g. of $K_2S_2O_8$ in 25 cc. of water, add 4–5 g. of KI and dil. to 100 cc. after the reaction has been allowed not more than 1 hr. to become complete. Müller and Ferber (*Ber.* **38**, 3965) used $FeSO_4$ to accelerate the reaction between persulfate and iodide in neutral soln. The reaction will take place promptly if 4 g. KI is used without the $FeSO_4$ or 3 g. of NH_4Cl with 1 g. of KI. Müller (*C. A.* **7**, 2173) also published a method for converting iodide to iodate by the action of persulfate in alk. soln.; then the IO_3^- is measured by treating with acid and titrating the evolved I_2. This method does not apply to $(NH_4)_2S_2O_8$ because some nitrite is formed. M. noted that the presence of H_2O_2 caused difficulty but this can be overcome by first adding enough $KMnO_4$ to the acid soln. after detg. how much permanganate is needed by a special expt. Kolthoff (*Z. anal. Chem.* **60**, 455) has made use of the fact that ferricyanide is formed from ferrocyanide by treatment with persulfate in neutral soln. Then on adding KI and acid, I_2 is liberated and can be titrated with thiosulfate. This method was tested and found to be excellent. Müller and Dieferthäler (*C. A.* **4**, 2783) started with the same original reaction but detd. the excess ferrocyanide by titration with $KMnO_4$. This method also is shown to be good. Finally, it is possible to analyze a persulfate by causing it to react with an excess of $SnCl_2$ and titrating the excess iodometrically. This method also gives good results.

W. T. H.

Volumetric method for determination of sulfate ion. Frederick G. Germuth. *J. Am. Water Works Assocn.* **19**, 607–9(1928).—The method described advocates the employment of 0.02 *N* $BaCl_2$ as precipitant, and subsequently back titration with 0.02 *N* K_2CrO_4, the end point being det. by the utilization of $Pb(NO_3)_2$ as outside indicator. Greater accuracy is claimed for this method as compared to that of Wildenstein, from which it differs both in concn. of solns. used as well as choice of outside indicator.

F. G. Germuth

Determination of hydrocarbon vapors in air by means of active charcoal. E. Posner. Forschungs lab. des Volkskommisariats für Arbeit des A. S. S. R., Baku. *Z. anorg. allgem. Chem.* **174**, 290–4(1928).—"Zelinsky" and "Bayer A. K. H." charcoals were used for the quant. adsorption of hydrocarbon vapors from a measured current of dry, CO_2-free air (about 60 l./hr.). The gain in wt. of the charcoal tube was detd. Various vapors, such as hexane, benzene, kerosene, gasolene, were detd. in control expts. involving known amts. between 0.79 and 5.5 mg./l. The known air-vapor mixts. were made by humidification of the air stream at proper temps. The observed results check those calcd. from the vapor pressures within ± 0.05 mg./l.

R. L. Dodge

The analytical utilization of a catalysis produced by carbon bisulfide for the iodometric determination of azides and for the detection of carbon disulfide. F. Feigl and E. Chargav. Univ. Wien. *Z. anal. Chem.* **74**, 376–80(1928).—The reaction $2\ NaN_3 + I_2 = 2\ NaI + 3\ N_2$ takes place if a little CS_2 is present and can be used for the detection of very small quantities of CS_2 and for the detn. of azides. The reaction takes place in 2 stages. The Na salt of azidodithiocarbonic acid is first formed by the reaction of CS_2 with NaN_3 and is at once oxidized by the I_2 present, giving back the original CS_2. To 5 cc. of an aq. soln. of CS_2 add 1–2 cc. of a soln. which is 0.5 *N* in NaN_3 and 0.1 *N* in I_2. If 0.02 mg. of CS_2 is present there will be an immediate evolution of N_2. If H_2S is present, first oxidize it with I_2 before applying the test. For the evalua-

tion of NaN_3, place 0.5 cc. of CS_2 and 6–8 cc. of pure acetone in a 500-cc. flask, add a moderate excess of 0.1 *N* I_2 soln. and a definite vol. of the azide soln. Shake and after 5–10 min. titrate the excess I_2 with arsenite soln. W. T. H.

The determination of reducing sugar. N. SEMIGANOVSKII. Chem. Pharm. Inst. of Moscow. *Z. anal. Chem.* **74,** 400–2(1928); *Trans. Sci. Chem.-Pharm. Inst.* (Moscow) **1926,** 33–5.—An interesting method of analyzing the Cu_2O ppt. produced by the action of a reducing sugar on Fehling's soln. consists in treating the well-washed ppt. with a soln. contg. 15% NaCl, 1% HCl and 0.5% $MnSO_4$ Then by adding 0 2% $KMnO_4$, the $Cu_2Cl_4^{--}$ soln. is converted into Cu^{++} which can be titrated by the iodide method (adding an excess of KI and titrating the liberated I_2 with $Na_2S_2O_3$). W. T. H.

Analysis of Se (KRAK) **18.** Se cells as colorimeters (MICKWITZ) **2.**

CORNOG, JACOB, AND VOSBURGH, WARREN C.: **Introductory Qualitative Analysis.** New York: The Macmillan Co. 155 pp. $1.60.

GOOCH, FRANK AUSTIN AND BROWNING, PHILIP EMBURY: **Outlines of Qualitative Chemical Analysis.** 6th ed. revised. New York: J. Wiley & Sons, Inc.; London: Chapman & Hall, Ltd. 206 pp. $1.75.

8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY AND J. F. SCHAIRER

Methods for the microscopic examination of metallic minerals. J. ORCEL. *Bull. soc. encour. ind. natl.* **1928,** No. 6, 503–27; cf. *C. A.* **22,** 2529.—The use of the microscope in the study of minerals in America and Germany is reviewed. Modern methods and app. are described and results are recorded of the microexamn. of thin sections or of polished surfaces of niccolite, covellite, famatinite, bournonite, chloanthite, gersdorffite, bismuthinite, sphalerite, galena, pyrite and arsenopyrite. L. W. RIGGS

Magnetic, electrochemical and photochemical tests in the identification of opaque minerals. H. E. MCKINSTRY. Harvard Univ. *Econ. Geol.* **22,** 669–77(1927).—Pt electrodes sealed in a glass tube and connected to 2 dry batteries are used in drops on the surface of polished sections to facilitate etching, to help bring a mineral into soln. for microchem. tests, and to obtain a qual. test for Cu on a no. of minerals Certain Ag minerals, as cerargyrite, sulfides, sulfarsenides and sulfantimonides, develop tiny, shining yellowish globules or blebs on a strongly illuminated surface which may be conveniently observed under the oil immersion objective on a reflecting microscope. ELLIOTT J. ROBERTS

The equilibrium diagram of pyrrhotite and pentlandite and their relations in natural occurrences. W. H. NEWHOUSE. *Econ. Geol.* **22,** 288–99(1927).—Cooling curve data are given for mixts. of FeS and NiS + S contg. up to 50% NiS. With rapid cooling, pyrrhotite may be secured contg. up to 13% Ni in solid soln. ELLIOTT J. ROBERTS

Crystallographic investigations of the pyrite of Komitates Krassó-Szörény. KAROLY ZIMÁNYI. *Matematik. Természettudományi Értesitö* **41,** 152–7(Hung.), 158(Ger.). (1925); cf. *C. A.* **18,** 647.—Pyrite occurs at least as an accessory mineral in all the mines of the region. Crystallographic data are given for a large no. of different types of crystals. J. S. REICHERT

Occurrence of tridymite and cristobalite in a granitic xenolith. A. ALLEN WEYMOUTH. *Am. J. Sci.* **16,** 237–8(1928).—The xenolith that furnished the material for this study was found in a road cut 10 miles north of New Meadows, Idaho. It contained quartz, orthoclase, oligoclase, muscovite, biotite, chlorite, garnet, Fe oxide, zircon, tridymite and cristobalite. The tridymite, forming nearly 1% of the rock, occurred in apparently isotropic flakes, with mean n = 1.475. The cristobalite, which was present in a much smaller proportion than 1%, had the same optical properties as tridymite except that n = 1.485. A silica brick, which had been heat treated at 1400°, contained 70–75% of cristobalite identical with that found in the xenolith except for its lack of inclusions. L. W. RIGGS

Two kinds of magnetite. W. H. NEWHOUSE AND W. H. CALLAHAN. Mass. Inst. Technology. *Econ. Geol.* **22,** 629–32(1927).—N. and C. suggest that the brown magnetite found in various localities is "oxidized magnetite" similar to that described by Sosman and Posnjak (*C. A.* **19,** 3077). ELLIOTT J. ROBERTS

Dehydrated gibbsite. JACQUES DELAPPARENT AND ERNEST STEMPFEL. *Compt.*

rend. **187,** 305–6(1928).—Gibbsite, prepd. by the method of Bayer, forms hexagonal prisms. On heating by stages the hexagonal crystals undergo various changes at different temps. and at 600° become orthorhombic. L. W. RIGGS

Crystallographic examination of Hungarian calcites. MÁRIÁ VENDL. *Matematik. Természettudományi Ertesitö* **43,** 255–63(Hung.), 264–5(Ger.), (1926); cf. *C. A.* **21,** 1610.—A description of 42 forms of crystals of calcite from various localities. J. S. REICHERT

Analysis of Hungarian dolomite crystals. ILONA STROBENTZ. *Földtani Közlöny* **55,** 49–57 (Hung.), 275 (Ger.) (1925) (published 1926); *Mineralog. Abstracts* **3,** 301 (1927).—The following 15 analyses were made on carefully selected crystd. material from 11 Hungarian localities.

	CaO	MgO	FeO	Fe_2O_3	Al_2O_3	CO_2	Insol.	Total
(1) Normal dolomite without FeO; $CaMg(CO_3)_2$								
Selmeczbánya	31.22	21.36	—	0.14		47.22	0.37	100.31
Selmeczbánya	32.76	19.97	—	0.31		47.31	0.22	100.5[illegible]
Kapnikbánya	31.04	21.02	—	0.68	0.58	46.90	0.14	100.36
Nagybánya	29.60	21.60	—	0.35	0.23	46.50	1.49	99.77
(2) Dolomite without FeO; $Ca_3Mg(CO_3)_4$								
Selmeczbánya	43.71	9.81	—	0.22	0.14	44.23	1.83	99.94
(3) Dolomite with small quantities of FeO; $Ca(Mg,Fe)(CO_3)_2$								
Úrvölgy	30.84	19.63	1.67	—	0.51	46.67	0.07	99.39
Óradna	31.15	19.61	1.33		1.89	46.94		100.92
(4) Dolomite with more than 5% FeO (ankerite); $Ca(Mg,Fe)(CO_3)_2$								
Boicza	33.23	7.78	12.81	2.57		42.31		98.70
Vaskö	30.69	15.16	6.74	1.27	2.18	44.65	0.22	100.91
Vaskö	28.93	17.23	5.66	—	2.26	44.87	1.58	100.53
Magurka	28.62	13.70	11.86	—	1.16	44.64	0.23	100.21
Ötösbánya	27.55	11.22	17.10	—	1.58	42.74	0.74	100.93
(5) Ankerite in which FeO replaces CaO; $(Ca, Fe)(Mg,Fe)(CO_3)_2$								
Felsöbánya	13.68	14.47	26.00	—	0.31	42.32	3.53	100.31
(6) Dolomite with MnO; $Ca(Mg,Mn,Fe)(CO_3)_2$								
Hodrusbánya	33.84	14.27	1.68	3.97	—	44.21	—	99.84*
Vaskö	27.13	14.31	1.28	—	2.32	47.26	0.39	99.08†

*Also MnO 1.87 †Also MnO 6.39

The ankerite from Felsöbánya occurs as lenticular rhombohedra on quartz with wolframite. The sp. grs. of the materials analyzed were not detd. H. G.

Crystallographic monograph on Hungarian cerussite. LÁSZLÓ TOKODY. *Matematik. Természettudományi Ertesitö* **43,** 382–94(Hung.), 395–6(Ger.), (1926).—Crystallographic data on 49 forms are given. J. S. REICHERT

The riebeckite of Alter Pedroso. ALADÁR VENDL. *Matematik. Természettudományi Ertesitö* **41,** 206–13(Hung.), 214(Ger.) (1925).—The pegmatitic veins of alkali syenite of Alter Pedroso carry an amphibole in large individuals. This amphibole, previously identified as riebeckite, is shown to belong to the osannite series. The optic axial plane is ⊥ the symmetry plane. βx_a:C = $1^1/_4$°, for red = 0°, and for blue = 3–5° in the angle β; index β = 1.6934; sp. gr. = 3.371. From the analysis: SiO_2 49.92, TiO_2 0.65, Al_2O_3 1.99, Fe_2O_3 13.35, FeO 18.46, MnO 2.24, MgO 2.07, CaO 1.25, Na_2O 6.55, K_2O 0.95, H_2O^- 0.24, H_2O^+ 2.03 and F 0.45, the following components were calcd.: riebeckite 39.98, glaucophane 9.28, arfvedsonite 29.79, and actinolite 20.95%. J. S. REICHERT

Study of the chlorites by means of x-rays. CH. MAUGUIN. *Compt. rend.* **186,** 1852–5(1928).—Three chlorites, penninnite, leuchtenbergite, and grochauite, though differing widely in chem. compn., show similar crystal structures and unit cells of the same size. In each the unit appears to contain 18 O atoms and 18 electro-positive atoms (Si, Mg, Fe^{++}, Fe^{+++} and Al). Substitution among the electropositive atoms which preserves the proper valence relations appears possible without disturbing the crystal structure. In this behavior the chlorites are analogous to the micas. The rotating crystal method was used. R. L. HERSHEY

Whewellite crystals from Kapnikbánya. SÁNDOR KOCH. *Matematik. Természettudományi Ertesitö* **42,** 151–6(Hung.), 157(Ger.), (1926).—Data on the structure of a water-white crystal 67 × 45.5 × 40 mm. in size are given. J. S. REICHERT

Ajkaite, a fossil resin from Hungary. LÁSZLÓ ZECHMEISTER. *Matematik. Természettudományi Ertesitö* **43,** 332–40(Hung.), 341(Ger.), (1926).—In the lignite deposits at Ajka, nut-size resinous inclusions are present. The hardness $2^1/_2$, sp. gr. =

1.05–6, n_D^{18} = 1.5412, color yellow to dark brown, m. p. indefinite; it is slightly sol. in alc. and ether, 4% sol. in $CHCl_3$, and contains no ash, N_2, or halogen. A light yellow sample contains C 80.38, H 11.00, O 7.20, S 1.42%, a dark one C 79.01, H 9.89, O 9.61, S 1.49%. Acid value 0, saponification no. about 160. Upon heating H_2S escapes first, then an oil (82% of the wt. of the resin) which contains O and but little S. No succinic acid is obtained by heating or by a treatment with alkali. When boiled with HNO_3 (1:2) it takes up 6.5% N. J. S. Reichert

Intimate intergrowths and mutual boundaries as proof of contemporaneous deposition. W. H. Newhouse. *Econ. Geol.* **22**, 403–7(1927).—Hematite was artificially replaced by magnetite by application of a reducing flame. Bornite and chalcopyrite were partially replaced by chalcocite by immersing polished specimens in a strong $CuSO_4$ soln. for several days at about 70°. Elliott J. Roberts

Classification of magmatic ore deposits. A. N. Zavaritskii. Mining Inst., Leningrad, Russia. *Econ. Geol.* **22**, 678–86(1927).—Z. presents a physico-chem. scheme of classification for magmatic ore deposits: (*A*) Deposits formed by crystn. differentiation. (1) Accumulative deposits, (2) "Fusive" deposits. (*B*) Liquation deposits. (1) Straight liquation deposits, (2) Syntectic liquation deposits. Examples are given. Elliott J. Roberts

Recent evidence confirming the zonal arrangement of minerals in the Cornish lodes. E. H. Davison. *Econ. Geol.* **22**, 475–9(1927).—Observations on 3 new shafts and a tunnel near Camborne, Cornwall, Eng., confirm D.'s previous conclusions with regard to the zonal arrangement of the minerals in this district (Handbook of Cornish Geology, 1926). E. J. Roberts

Mineral deposits of the Hyder district, southeastern Alaska. W. B. Jewell. Vanderbilt Univ. *Econ. Geol.* **22**, 494–517(1927).—A peculiar zoning is present in which pyrite, galena, chalcopyrite, tetrahedrite-freibergite, quartz and barite show a tendency to occur in the genetically associated intrusive, and pyrrhotite, arsenopyrite, sphalerite and calcite in the roof rocks. The parent magma was probably relatively dry. Five minerals are described, associated with galena and tetrahedrite in the polished sections, which could not be identified. Elliott J. Roberts

Oxidation products derived from sphalerite and galena. P. F. Boswell and Roland Blanchard. *Econ. Geol.* **22**, 419–53(1927).—Sphalerite and galena may dissolve without generation of, or attack by, Fe-bearing solns., thus leaving no limonite. Neither primary nor secondary Zn minerals are as likely to remain in a leached cropping as are primary and secondary Pb minerals, once oxidation is well advanced. Elliott J. Roberts

Ore deposits of the Rio Tinto (Huelva) district, Spain. Alan M. Bateman. Yale Univ. *Econ. Geol.* **22**, 569–614(1927).—The following minerals, previously unreported from this district, were identified in polished sections: luzonite, famatinite, chalcostibite, whitneyite, umangite, hauchecornite, ullmanite, berthierite and three undetd. These minerals account for the presence of small amts. of Ag, Bi, Ni, Co, Sb and Se found in the ore. The ore bodies, consisting chiefly of pyrite, are normal hydrothermal replacement deposits, having been formed by aqueous solns. replacing the adjacent porphyry and slate with sulfides. Elliott J. Roberts

Tourmaline-bearing cinnabar veins of the Mazatzal mountains, Arizona. K. Hummel. *Econ. Geol.* **22**, 407–8(1927).—This deposit possibly formed by secondary enrichment of a high temp. Cu tourmaline deposit exceptionally rich in mercurial tetrahedrite. Elliott J. Roberts

Geology of the platinum metals. J. H. L. Vogt. *Econ. Geol.* **22**, 321–55(1927).—A review of the genesis of Pt-bearing deposits in general, including a summary of old analyses of Pt and the associated rocks, and a summary of the world's production from 1860 to 1922. The deposits fall into 2 main types (1) occurring in dunites (and pyroxenites); and (2) occurring in nickeliferous pyrrhotite in norite; both are due to magmatic differentiation. Elliott J. Roberts

Origin of the Gunflint iron-bearing formation. J. E. Gill. Univ. of Rochester, N. Y. *Econ. Geol.* **22**, 687–728(1927).—SiO_2 and Fe in colloidal soln. were pptd. slowly at some distance from the river mouths. The pptn. is believed to have been entirely independent of organisms. Elliott J. Roberts

Geological relations of the North African iron ores. Per Geijer. Geol. Survey, Stockholm, Sweden. *Econ. Geol.* **22**, 537–64(1927).—A survey, based on the literature and a personal visit. Total ore reserves are estd. to be > 100 million tons. Low P, S, and SiO_2 characterize the greater part of the ore. Fe runs 55–60%. Part of the ores are of the Bilbao type being originally siderite, now extensively replaced by hema-

tite. The other type was originally magnetite, now partially oxidized to hematite. These latter ores are low in Mn, while the former run from 1 to 2%. E. J. R.

The natural resources of Wales. F. J. North. *Brit. Clayworker* 37, 190–1 (1928).—A non-technical description of how clay is formed. Different types of clays in Wales, their possible origin, and various products manufactured from them, are discussed. R. A. Heindl

Solikamsk carnallite and sylvite. D. Shtern and P. Levin. *J. Chem. Ind. (Moscow)* 5, 382–5(1928); cf. Volf and Yatlov, *C. A.* 22, 3495; Efremov and Veselovskii, *C. A.* 22, 3495.—The compn. of Solikamsk K salts compared with those of Stassfurt and the Dead Sea is as follows:

	% KCl	% $MgCl_2$	% NaCl	% anhydrite	% $CaCl_2$
Solikamsk carnallite	23.5	26	20.5	1/2	–
Stassfurt carnallite	16–20	20–25	24	0.5–2	–
Solikamsk sylvite	18.5–44	0–0.3	53–78	1.4	–
Stassfurt sylvite	28–40		57.7	0.1–1	–
Dead Sea	1.3	2.2	12	0.8	6

The compn. of Solikamsk carnallite is thus more favorable than that of the Stassfurt material. Solikamsk K salts have the following advantages over the Stassfurt salts: (1) contg. but a negligible amt. of $MgCl_2$, Solikamsk sylvites permit the manuf. of fairly pure KCl by cold crystn., whereas the more expensive hot crystn. method is required at Stassfurt; (2) Solikamsk carnallites, as a result of the favorable geological structure of the ground in which they are mined, can be subjected to an easy mech. sepn. of poor from rich material, whereas the Stassfurt carnallites cannot. B. N.

Origin of the Cretaceous white clays of South Carolina. Fred R. Neumann. *Econ. Geol.* 22, 374–87(1927).—A heavy-liquid and microscopical analysis of some white clays and assocd. sandy clays and sands are given. The deposits were probably formed by the erosion of an uplifted Piedmont area which had been deprived of its Fe by leaching with org. and carbonic acids from a dense vegetational covering. Elliott J. Roberts

The enrichment of bauxite deposits through the activity of microörganisms. George A. Thiel. Univ. of Minnesota. *Econ. Geol.* 22, 480–93(1927).—Leaching expts. on shale, kaolinite, white clay and microcline show a much higher ratio of Al_2O_3 to SiO_2 dissolved when sulfate-reducing bacteria are present than when they are absent. T. considers this to explain the SiO_2-rich mantles of many bauxite deposits. Pyrite is formed by the bacteria, is subsequently oxidized to $FeSO_4$ and H_2SO_4, which leaches the Al_2O_3 from the soil and this is repptd later by hydrolysis. Elliott J. Roberts

Carbon compounds of the magma. Hellmers. *Z. angew. Chem.* 41, 342–3(1928).—From the fact that carbides are not capable of existence in the solid crust of the earth yet probably exist in the magma, it may appear conceivable that the CH_4 which is present in the gases from fumaroles is a product of the action of H_2O on carbides. The temp. of its formation under these conditions would be so high, however, that the gas would be largely dissocd. into its elements, so that it is much more probable that it owes its origin to the reactions $CO + 3H_2 = CH_4 + H_2O$ and $2CO + 2H_2 = CH_4 + CO_2$. CO may well arise in the main from the action of C on CO_2, but the reaction of C with steam must also be taken into account. Examn. of 3 specimens of igneous rocks containing bitumen showed that this latter was a late introduction into the rock, and could not have been formed *in situ*, *e. g.*, by polymerization. No perfectly definite example of the formation of mineral oil deposits directly from the magma has, in fact, ever been observed. B. C. A.

Pneumatolysis as a mineralizer. James Park. *Chem. Eng. Mining Rev.* 20, 224(1928).—Pneumatolysis is defined as the action on rocks by gas evolved from igneous magma. Mass alteration of rocks may occur, accompanied by formation of secondary minerals and of lodes. The shape of the deposit is detd. by the form of the fissures, etc., in the rocks accessible to the volatile mineralizers. The vapors decompose certain constituents of the rock with the production of new minerals, *e. g.*, silicification, gneissization, kaolinization, chloritization, etc. In granites, the feldspars and micas, and in sedimentary rocks, the calcareous constituents, are mainly attacked. Biotite can be changed to muscovite or, in the presence of B_2O_3 to tourmaline; sulfides, CO_2 gas, or carbonates change biotite to chlorite. Consolidation of the magma is followed by the hydrothermal phase in which substances volatile at higher temp. are more stable. The magmatic H_2O changes peridotite to serpentine. Subsequent leaching by surface waters produces local concn. of chromite, Ni and Co as in New Caledonia, or of chromite and Cu as in New Zealand. S. L. B. Etherton

Petrogenetic observations on the andesites of the district of Pilisszentlászló (Comitat Pest, Hungary). Endre Lengyel. *Földtani Közlöny* **55**, 118–27 (Hung.), 309–19(Ger.), (1925 (published 1926); *Mineralog. Abstracts* **3**, 291(1927).—Eruptive rocks are of wide distribution in this dist. and include: biotite-amphibole-andesite, amphibole-andesite, hypersthene-andesite, pyroxene-andesite and andesite-tuffs. Pyroxene-andesite predominates and biotite-amphibole-andesite is of secondary importance. A detailed description is given of these rocks and of their mineral constituents chiefly from a petrogenetic standpoint. The more acidic tuffs are the earliest, and afterwards the rocks are successively more basic. H. G.

Lavas of the Serbian meridional. J. Tomitch. *Compt. rend.* **187**, 133–6(1928).—This study is mainly lithological. Chem analyses by Raoult are reported for the typical rocks: aphyric latite and vitreous latite from Venaz, latite from Dyouriski Vis, shoshonitic basalt from Gradisté and shoshonitic kajanite from Kourel. L. W. Riggs

Geology of the south coast of New South Wales. I. Paleozoic geology of the Moruya district. Ida A. Brown. *Proc. Linnean Soc. N. S. Wales* **53**, 151–92(1928).—The geology is described from the dynamic and lithologic points of view, with 49 references to the literature The order was deposition, folding and faulting, and, toward the close of Devonian time, the injection of a plutonic igneous mass along the zone of weakness. The plutonic mass takes the form of a composite batholith, and forms a complete subalk. or calcic igneous complex, as is proved by a study of the field relationships and the mineralogical and chem. compns. of the various members of the series. The complex consists of 3 main plutonic types, diorite-gabbro, tonalite-granodiorite and biotite-granite, contg. accidental and cognate xenoliths in some parts, and a series of dike rocks ranging from aplitic to basaltic varieties. Chem. analyses of about 20 rocks are given. L. W Riggs

Preliminary statement regarding the diatom "epidemics" at Copalis Beach, Washington, and an analysis of diatom oil. L. B. Becking, C F. Tolman, H C. McMillin, John Field and Tadaichi Hashimoto. *Econ. Geol.* **22**, 356–68(1927). During diatom development the p_H of the sea water is shifted from the normal value of about 8.4 to 8 6 or even 8.8. A study of the chloroform-benzene ext. of the diatoms showed a high % (11.3% of the chlorophyll-free extract) of a S compd. whose m. p. was 115°. The remainder of the ext contd. 65.7% unsaponifiable matter. E. J. R.

Diatoms in western Oregon shales. Hubert G. Schenck. Stanford Univ. *Econ. Geol.* **22**, 565–8(1927).—Analyses of 2 tuffaceous sandy shales from Oregon are given. Elliott J. Roberts

Replacement vs. impregnation in petrified wood. Ruth N. St. John. Cornell Univ. *Econ. Geol.* **22**, 729–39(1927).—Expts. on various petrified woods showed 3 types or stages of petrification: (1) Cell cavities and intercellular spaces have been filled by infiltration of mineral matter but the vegetable tissue of the cell walls is preserved; (2) complete replacement of the plant tissue has taken place; and (3) intermediate between 1 and 2. Silicified samples of type 1 leave a residue of tissue outlining the cell walls when treated with an alc. soln of H_2F_2, while those of type 2 dissolve completely. Elliott J. Roberts

Origin and mineral constitution of the Late Tertiary fossil wood of Burma. Harbans Lall Chhibber. *J. and Proc. Asiatic Soc. Bengal* **23**, No. 1, 13–26(1928).—The theories of W. Theobald and of Murray Stuart with reference to the formation of petrified wood are not accepted. Chalcedony and microcryst. SiO_2 generally, and opal occasionally, form the bulk of the specimens. Calcite and siderite are occasionally present. In exceptional cases quartz has been deposited in the broad bundles of the vascular tissues while the parenchymatous tissue has been replaced by Fe and Ca carbonates. "The origin of fossil wood is due to colloidal material associated with waters laying down the deposits in which it is preserved." The lithology of the Irrawaddy series supports such an origin Both mech. and chem. weathering helped in the formation of colloids. Some of the colloidal material seems to have been changed into crystalloidal afterwards. Fresh-water desert conditions are favorable to the formation of fossil wood, especially when alkalies are present in abundance to decompose the silicates and liberate colloidal SiO_2 to be deposited in the woody tissue. L. W. Riggs

Great Bahama Bank. Marine sediments. Richard M. Field. Princeton Univ. *Am. J. Sci.* **16**, 239–46(1928).—A geological reconnaissance is reported of the west coast of Andros Island and of the Great Bahama Bank. L. W. Riggs

Geographic and oceanographic research in Indian waters. II. Nature of the sea-bed and of the deep-sea deposits of the Andaman Sea and Bay of Bengal. R. B.

SEYMOUR SEWELL. *Mem. Asiatic Soc. Bengal* **9**, No. 2, 27–49(1925).—The $CaCO_3$ content in 28 samples of ocean bottom mud or ooze from the south central portion of the Bay of Bengal averaged 45.4%. The depths of these samples ranged from 1427 to 3655 m. Detns. by Alcock in the northwest regions of the bay averaged 9.1% in 27 samples. In general, in passing from shallower to deeper waters there is at first a decrease in the percentage of $CaCO_3$ in the bottom mud. This is followed by an increase and again by a second decrease. The possible relations between the quantity of $CaCO_3$ deposited and the quantities of SiO_2 and CO_2 present in the water, the depth and the movement of ocean currents are discussed. L. W. RIGGS

Recent investigations in geochemistry. ERICH HERLINGER. *Z. angew. Chem.* **41**, 249–54(1928). E. H.

Radioactivity of the gases and water of the Ukhta oil-bearing region and of medicinal mud and brine from the salt lake of the Tinakee Station (CHEREPENIKOV) **3.** Constitution of the silicates (WAHL) **6.** Constitution of aluminosilicates, conditions of their formation, and transformation in soil (WAHL) **6.** Mineral black (LANGTON) **26.** Researches on silicates (CHERBULIEZ, ROSENBERG) **6.** Chemical and economical considerations concerning wood and coal (BERGIUS) **21.** The origin of coal (OBST) **21.** Panuco oil field, Mex. (BAKER) **22.** Limestones as a source of oil (TRASK) **22.** Effect of pressure on the migration and accumulation of petroleum (VAN TUYL, BACKSTROM) **22.** Determining porosity (RUSSELL) **22.** Strains and their removal by breaking and gliding (RINNE) **2.** Radiometric exploration of oil deposits (BOGOIAVLENSKY) **3.**

KRAUS, EDWARD HENRY AND HUNT, WALTER FRED: **Mineralogy.** An introduction to the study of minerals and crystals. 2nd ed. revised. New York: McGraw-Hill Book Co., Inc. 604 pp. $5.00. Cf. *C. A.* **15**, 493.

9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST, R. H. ABORN

Contributions to the question of heat changes in metallurgical reactions. C. SCHWARZ. *Arch. Eisenhüttenwesen* **1**, 525–6(1928).—The heats of metallurgical reactions using C, tabulated in "Investigations on the Available Heat of Siemens-Martin Fusions" (*Ibid* **1**, 33–40(1927)), must be revised, because of the new work of Roth in the 1927 supplement of Landolt-Börnstein's "Phys.-Chem. Tables." The most reliable values of heats, at present obtainable for use in Siemens-Martin practice, are tabulated. J. BALOZIAN

Three stages of the development of French siderurgy. LOUIS BARADUC-MULLER. *Science & industrie* **12**, No. 168, 33–8(1928). E. H.

Efficiency in hydraulic current classification of finely crushed ores. T. GRAHAM MARTYN. *J. Chem. Met. Mining Soc., S. Africa* **28**, 283–302(1928).—A discussion of the general problem of classification and of the Martyn classifier. The paper is divided into 12 sections: (1) the problem of classification—Cornish Sn slime; (2) the sepn. of slime from heavier materials; (3) early machines and processes; (4) the fall of particles—hindered and unhindered in liquid; (5) concentrates made from classified products; (6) slime sepn. before classification; (7) sepg. fine particles first and the heaviest particles last; (8) the problem of slime settlement; (9) special form of separator; (10) Martyn's perfected slime classifier; (11) Martyn's sand classifier; (12) Martyn's complete machine. The evolution of M.'s classifier is indicated by sketch and description and details are given of the perfected app. The app. should be widely applicable for uses such as: washing and classifying all *sands used in concrete* work; for the purification of *clays* and *paints;* for the washing of pulverized carbonaceous *fuel;* for the removal of shale and pyrites from *coal;* for the grading of *abrasives* such as corundum; and for the washing and grading of sand in the *filter beds of water works* and *sewage-treatment works*. It is possible that the app. might be used in the sepn. and *washing of crystals* sol. in water, in which case water is replaced by a liquid in which the crystals are insol. The app. permits continuous classifying, into as many different grades as desired, of mixed particles of varying size and sp. gr., classification being according to their unhindered rate of fall in liquid. W. H. BOYNTON

The working and behavior of zinc-bearing iron ores, particularly the Meggener roasted pyrites, in the blast furnace. MAX PASCHE. Saschsischen Bergakademie, Freiberg. *Archiv Eisenhüttenwesen* **1**, 387–403(1927).—This ore is difficultly smelted

in the Zn muffle because of its high Fe content, and in the blast furnace because of its fineness, and its Zn and S content. Two processes are developed for smelting this type of ore. In the first by sintering in a Dwight-Lloyd machine (preferably) or in a revolving-furnace the ore is caked; 90–95% of the S, only 6–7% of the Zn, and over 1/2 the Pb and As are removed. The sinter may then be smelted directly in the blast furnace providing the sinter is porous, the charge and coke are dry, the furnace is constructed of suitable materials, and the throat gases leave at the highest possible temp. By mixing NaCl (50% in excess of that required to form $ZnCl_2$) with the sinter, the vaporization of Zn is aided and the deposition of Zn deposits in the furnace and in the flues is prevented. In both cases the Zn compds. volatilized during the smelting are collected and the Zn is recovered. A method is given whereby the SO_2 gases formed in the sintering may be converted into H_2SO_4. In the second process, the roasted pyrites is smelted in the blast furnace (without sintering), ferro-Mn being added in sufficient quantity to produce a liquid slag. By blowing compressed air through the melt during the smelting, the metal obtained contains 30–38% Fe and 6–7% Mn, the S being completely burned, and the Zn, Pb and As vaporized. S and Zn are recovered as before.

J. BALOZIAN

Cyanide extraction of gold and silver associated with arsenic and antimony in ores. EDMUND S. LEAVER AND JESSE A. WOOLF. Bur. Mines, *Tech. Paper* **423**, 52 pp.(1928).—Ores in which Au and Ag are assocd. with As and Sb are usually refractory to CN treatment. Results of this investigation show what to expect with CN treatment in cold and hot solns. and effect of roasting at various temps. A short-time roast for approx. 30 min at 450° seems to result in max. CN recovery of Au and Ag assocd with As and Sb. The usual high-temp. roast at 600° and above results in the formation of arsenates and antimonates, which interfere with soln. of Au and Ag. The addn. of CaO before CN treatment prevents excessive loss of CN and fouling of soln.

H C PARISH

Condenser materials and blue powder in zinc smelting. RUSSELL W. MILLAR. *Mining & Met.* **9**, 395(1928).—Expts. have proved that when pure Zn vapor and pure CO are brought together at partial pressures of 0.03 and 0.5 atm. and temp. of 650° the reaction, Zn gas + CO = Solid ZnO + C, takes place extremely slowly in the absence of an active catalyst. No increase in rate of reaction was noted at 850°. The presence of clay contg. Fe promoted the reaction at a high rate, Fe_2O_3 apparently acting as a catalyst. M. suggests that an investigation of the relation between Fe content of clays and the rate of formation of chem. blue powder in condensers made from the clays would elucidate one cause of inefficient condensation of Zn in the present app.

H. C. PARISH

The retreatment of Comstock tailings. E. S. LEAVER AND J. A. WOOLF. Bur Mines, *Repts. of Investigations* No. **2883**, 7 pp.(1928); *Eng. Mining J* **126**, 448 50.—The approx. metal content of Douglas tailings from Comstock ores is 2.8 oz. Ag, 0.055 oz. Au, 0.5 lb. Hg and 0.12 oz Cu. Gravity concn., straight cyanidation, a preliminary acid wash followed by aeration-oxidation were all unsuccessful, the latter because of added cost of preliminary acid treatment. Flotation tests resulted in recoveries from 21.8 to 41.7% of Au from 18.7 to 38.8% of Ag and 50% of Hg. Results of CN tests on Douglas tailings with regeneration of CN by Na_2S-H_2SO_4 pptn. method show extns. of 83.7–86.4% Au, 85.7–87.4% Ag and 42.6–52.5% Cu and regeneration of approx. 78% of CN. An extn. of 80–88% Au and 82.5–88.0% Ag from flotation tailings was obtained by the same method as well as a CN regeneration of 62.6%. H. C. PARISH

Salt roasting and cyaniding at Achotla, Mexico. I, II. Plant operations and results. E. R. RICHARDS. *Eng. Mining J.* **126**, 325–9, 370–5(1928).—A short history of the development of the process, and a description of the milling plant of the Achotla plant. Exptl. lab. results of salt roasting led to the construction of a 10-ton-per-day plant which embodied the following: (1) a complete crushing and screening plant, (2) a full-size standard Holt-Dorn roasting furnace, (3) calcine crushing rolls, (4) leaching vats, (5) Cu pptn. boxes to remove Ag from the first water wash, (6) Zn boxes for cyanide pptn., (7) storage tanks for cyanide solns., (8) fans, pumps and complementary app., (9) steam engines and boilers for power use, and (10) tower for making acid and storage tank for acid. The plant gave: (1) satisfactory Ag and Au extn., (2) easy and consistent operation, (3) low cyanide consumption with proper acid washing, (4) with low protective alky. in the cyanide effluent elimination of Pb in the ppt., (5) by agitating the pregnant soln. with air and a slight excess of lime, the $CaSO_4$ could be dropped and settled out in a settling tank and not enter the Zn boxes. Oxide ore is crushed to 8–10 mesh, mixed and roasted; acid is made from the roaster gases with which to leach the calcines. Leaching the calcines with water and

acid to remove base metals and cyanicides is followed by treating of the pregnant soln. with lime and filtering to clarify the soln. properly, pptg., the usual Merrill-Crowe process being indicated. Salt is crushed in a sep. plant. A flow sheet shows the roasting and leaching treatments and a plan of the plant. The chemistry of the process and the difficulties in starting the plant are outlined. Au extn. is 92–96% and Ag extn. 82–88%. The acid wash has an acid content of 0.25–0.35% by wt.—0.1–0.15% is SO_2 and the remainder HCl. About 4–5 tons of acid is used per ton of ore. A short water wash removes the acid from the charge. Salt is the most expensive reagent, costing $2.07 per ton of ore. Next comes cyanide. Lime consumption is 50–60 lbs. per ton of ore, and Zn dust consumption is close to theoretical requirements. Power consumption is about 21 kw.-hr. per ton of ore treated and labor cost about 50 c. per ton including mill overhead. W. B. H.

Forced heating of air blasts for blast furnaces. Fr. L. Clerf. *Chimie et industrie* **Special No.**, 202–16(April, 1928).—A general discussion, largely mathematical, of the operation of modern blast-heating equipment. A. Papineau-Couture

The mode of operation of blast-furnace stoves with special reference to the Pfoser-Strack-Stumm process. H. Illies. *Feuerungstech.* **16**, 189–90(1928).—In this process there are only 2 stoves in action per furnace, each 1 hr. on air and 1 hr. on gas. The efficiency is about the same as in the ordinary process. A proposal to use 3 stoves for 2 furnaces is promising. Ernest W. Thiele

Temperature measurements in the open-hearth furnace. B. M. Larsen. *Fuels and Furnaces* **6**, 1163–8(1928).—The best practice in detg. flame temps., slag and wall surface temps., bath temps. and furnace control by temp. measurements is described Flame temps. obtained by the disappearing-filament pyrometer are best made by adjusting the filament to disappear when the flame is brightest. The radiation measured from the surface of the slag or from the roof may be from 30° to 200° F. too high in consequence of heat reflected from the flame above the slag. Shutting off the flame a few seconds before making the reading obviates this error. The roof temp. of a basic furnace should not rise above 2975° to 3025° F., as deterioration by fusion of the silica brick is rapid above this temp. range. Slag-surface temps. detd. by means of an optical pyrometer measure fairly correctly the bath temp. if made when the gas is turned off. Thermocouples buried in the wall of the refractories may be used to obtain temp. gradients. Gas temps are best ascertained by drawing a rapid stream of the gas over the hot junction of the thermocouple. Pyrometer control of the checker-chamber and melting chamber permits more efficient operation of the furnace and affords an opportunity to protect the roof from too high temps. J. W. Shipley

Effects attributed to oxygen and to so-called de-oxidizers in the manufacture of open-hearth and converter steels. J. Seigle. École de la Métallurgie et des Mines, Nancy. *Chimie et industrie* **Special No.**, 345–61(April, 1928).—A crit. review of recent contributions to the subject. A. Papineau-Couture

The mode of operation of cupolas. J. Follman. *Feuerungstech.* **15**, 308(1927).—F proposes to separate the melting of Fe into 2 parts—melting at the lowest possible temp. in the cupola proper, and subsequent superheating with gas or oil in a hearth. This would have the advantages of the duplex process and be cheaper. E. W. T.

The Kühn regenerator system. Thaler. *Feuerungstech.* **16**, 123–5(1928).—This open-hearth regenerator is 16 m. long, as against a normal 4 m. The free area diminishes toward the end, to correspond to the decreased gas vol. The first section has a sloping bottom, to get rid of slag. The exit temp. is 250° against the usual 800°. In addn. to the heat economy, the capacity and life of the furnace are much increased. Ernest W. Thiele

Cleaning blast-furnace gas. Arthur J. Boynton. *Am. Inst. Mining Met. Eng. Tech. Publ.* No. **125**, 25 pp.(1928).—See *C. A.* **22**, 2131, 2533. W. H. B.

Blast-furnace gas indicates conditions. Wallace G. Imhoff. *Iron Age* **122**, 203–4(1928).—When the gas burns with a heavy bright yellow flame it shows the presence of a large amt. of extremely finely divided C particles. A large quantity of gas shows that conditions are such as to liberate large quantities of C for burning gas. Molten Fe tends to throw off C rather than to absorb it. This is shown by the thick mushy state of the Fe. C gives fluidity to the Fe and if too much has been removed from it the Fe is thick and pasty. The S is low in the Fe, while it is high in the slag. Removal of too much C as graphite builds up the hearth and holds the Fe in the furnace, resulting in high CaO, a cold hearth "off Fe" and low production. For high production and good, regular driving, the fusion zone should be down in the hearth. This gives a strong, yellow gas with high B. t. u. As the hearth cools the character and B. t. u.'s of gas change. The vol. of free S increases, SiO_2 reduced decreases, C tends to

be absorbed by Fe as combined C, the vol. of gas decreases and its heating value becomes low. The yellow gas gradually turns to orange, then to deep blue and finally to crimson red and violet. The vol. decreases, necessitating the use of coal at boilers to keep up steam. H. C. Parish

Studying gas to learn conditions. Wallace G. Imhoff. *Iron Age* **122,** 393–4 (1928).—Excess of C in gas gives a hot, yellow gas while a shortage gives a thin, cold, blue gas. A bluish purple gas is assocd. with a falling of the hearth temp. and a dropping of the fusion zone into the hearth. The Fe, when cast, instead of being a bright yellow color is orange. It glistens and shines because of a supersatn. of C. When cast the excess C in the Fe, under reduced pressure, is thrown out in the form of graphite Production depends primarily upon the rapidity of reduction of the Fe ore to metallic Fe and the smooth rapid driving of the furnace. Some of the conditions which give rapid driving are low fusion zone, moderate use of CaO, high hearth temp., proper wind, proper stove heat control, clean raw materials, right burden and good condition of equipment. H. C. Parish

Apparatus and methods for measurement of the Hertzian hardness. R. Esnault-Pelterie. *Engineer* **146,** 180 1, 196–7(1928).—The common methods of detg. hardness, *viz., sclerometric, rebound, Brinell, pendulum* and *Hertzian methods,* are discussed. In the proposed method, two spheres are subject to const. and successively increased pressures. One sphere has a thin coating which renders the zone of contact visible after each compression. The diam. of the circle of contact is plotted as a function of the force F. In general $d^3 = nF$ until the elastic limit is reached, when a cusp appears in the curve Typical results are given. D. B Dill

The classification of fractures in the testing of materials. Marcel Koenig *Chimie et industrie* Special No., 375–81(April, 1928).—A discussion of the aspect of the fracture of test pieces in tensile strength tests, which is affected by the mode of deformation, nature and condition of the metal, presence of localized flaws, direction of the deformation with respect to that of the fibers of the metal, the presence or absence of inclusions forming lines in the metal, and also possible play in the jaws of the machine or improper alignment thereof. Four different classifications of fractures are given, and it is suggested that they might be used as a basis for a universal classification which should be adopted. A. Papineau-Couture

Making low-carbon iron. C. R. McGahey. *Foundry* **56,** 723, 727(1928).—Coke contg. as much as 8.84% ash and 0.597% S may be good for cupola melting if strong enough. In making low-C Fe or semi-steel, the metal tapped first is of comparatively low strength, for a uniform mixt. is not obtained until the first charge is used up. For a chill test, a block 1½ by 3 in. is recommended, with the 1½ in. face cast against a chill at least 3 or 4 in thick. A few typical analyses are discussed on Fe that gave breaking strengths of 1800 to 2200 lbs. for a 1 by 1 by 24 in. bar. Geo. F. Comstock

The chief alloy steels and their uses. Persoz. *Aciers spéciaux* **2,** 233–7, 302–4, 354–6(1927); *Chimie et industrie* **20,** 52–3(1928).—It is considered that in alloy steels, as in C steels, only 3 phases can exist in equil.: ferrite or α phase; cementite; austenite or γ solid soln Known facts would indicate that these phases are the same as the corresponding phases of C steels. In practice, if only the heat treatment of an alloy steel of const. compn. is considered, such a steel may be considered as consisting of 2 independent constituents: a complex Fe alloy (complex ferrite) and a complex carbide (complex cementite), these 2 constituents being undecomposable within the limits in which the steel is studied. The equil. diagrams of alloy steels are thus analogous to those of C steels (Roozeboom diagrams). Grenet has suggested grouping alloy steel in 4 classes, according to their transformation pts. on heating and on cooling (best detd. by means of the Chevenard dilatometer): (1) Steels in which the transformation pt. on slow cooling is practically the same as on heating. C steels and most of the ordinary Si, Ni and Ni-Cr structural steels belong to this group. (2) Steels in which the transformation pt. on slow cooling (100° in 30 min.) is practically the same as on heating, and in which the transformation pt. on moderate cooling (about 100° in 10 min.) is considerably lower than on heating. This group includes high-speed (Cr, W and certain Cr-Ni) tool steels Some of these steels do not undergo any transformation between 300° and 600°; if the metal is cooled very slowly, the transformation takes place below 600°; if it is cooled more rapidly, it remains stable until it falls below 300°, even if it remains a long time at 300–600°. It follows that in order to harden such a steel it need only be cooled fairly rapidly to 550°; the transformation will then take place below 300° and the metal will be hardened. (3) Steels in which the transformation pt. on cooling differs greatly from that on heating. even when cooling is very

slow. The most important members of this group are Ni-Cr steels with relatively high Ni and Cr contents. (4) Steels in which the transformation pt. on cooling is below atm. temp., the chief ones being high-Ni steels (with or without Cr or Mn) and high-Mn steels. The compn. and uses of the most important alloy steels are given. A. PAPINEAU-COUTURE

Recrystallization of cast steel after hot working. W. HEIKE AND F. WESTERHOLT. Freiberg i. Sa. *Z. anorg. allgem. Chem.* **174,** 244–56(1928).—The cast steel examd. had the compn. 0.28% C, 0.60% Mn, 0.27% Si, 0.026% P, 0.020% S, and gave the following critical points: Ac_{2-3} 807.5°, Ar_{3-2} 758°, Ac_1 739°, Ar_1 709°. Castings of this steel in the form of cylinders, 20 mm. in diam. and length, were subjected to various degrees of compression after having previously been heated to 700–920°, the object being to eliminate the *Widmanstättian structure* and bring about recrystn. with small grain size. Examn. of the structure after compression shows that the large columnar crystals at first become subdivided into smaller grains having a directional orientation. With further change due to higher heating or greater compression, this directional orientation is destroyed and the grain structure becomes irregular. Subdivision of the Widmanstättian structure into fine grains commences at about 700° with about 35% compression. With temp. below this, recrystn. does not occur, regardless of the amt. of compression. The greatest alteration in grain structure occurs between 775° and 825° with 10% compression, between 760° and 810° with 20% compression, between 750° and 790° wit h 40% compression, and between 740° and 780° with 50% compression. Places in the castings rich in P, lag behind the others in the recrystn. process. H. STOERTZ

An investigation of abrasion in carbon steels. MASUHIRO SUZUKI. Jap. Govt. Rys., Tokyo. *Sci. Repts. Tohoku Imp. Univ.*, 1st Ser., **17,** 573–638(1928).—Steels contg. 0.11 to 0.88% C were tested for abrasion resistance by rotating the end of one tubular specimen against the end of another under a controlled pressure. The friction between the two was detd. by measuring the force required to keep the undriven specimen from revolving. Since the coeff. of friction is an important factor controlling the amt. of abrasion, measurements of the latter were made only after this coeff. had become const. by elimination of surface irregularities. Changes of temp., which were not over 50°, were disregarded. A large no. of tests with different combinations of specimens, loads and speeds, are recorded and discussed. The 0.11% C steel showed under some conditions less abrasion than the 0.22% C steel owing to slight differences in friction and work-hardening. Otherwise the abrasion was less with higher C up to 0.7 to 0.8%; and it also decreased as the condition of the steel changed in the following order: as rolled, annealed, sorbitic, troostitic and martensitic. The abrasion increased linearly with the work done, and parabolically with the coeff. of friction; it was affected slightly by velocity and pressure. A formula is derived, and constants for different structures are given so that the abrasion between two steels of 0.34 to 0.88% C can be computed if the abrasion between each of them and a standard is known. The structures of the specimens used are illustrated by photomicrographs. G. F. C.

New plates and powders for welding iron and steel at low temperature. PAUL DUFOUR. Conservatoire Nat'l des Arts et Métiers, Paris. *Chimie et industrie* Special No., 343(April, 1928).—Forge-welding of Fe can be carried out successfully at 1400°, just below the m. p., but with steel the temp. should not exceed about 1000°. This can be obtained with excellent results by using Fe filings which have been very highly carburized to lower their m. p. Such filings have the added advantage that they create a reducing atm. in the immediate neighborhood of the weld and thus prevent oxidation of the steel. A. PAPINEAU-COUTURE

Self-hardening property of chromium steel. ICHIJI OBINATA. *Memoirs Ryojun Coll. Eng.* **1,** 145–66(1928).—Steels were studied with from 7.1 to 18.6% Cr and 0.21 to 0.30% C in both the annealed and the quenched condition. In the annealed condition the effect of the Cr is to raise the Ac_1 point and to lower the Ar_1 point at the normal rate of heating. The A_2 magnetic change point is lowered about 7° for each addn. % of Cr. The stable structure of O.'s series of annealed specimens was pearlitic and probably consisted of a solid soln. of Fe and Cr and a Cr carbide with a little Cr as a solid soln. As there exist only 2 phases in the annealed specimens, the A_1 point of this steel does not occur at a const. temp. but varies according as the carbide dissolves in a solid soln. at that temp. From the microstructure of the quenched specimens, it was proved that, at certain ranges of temp., there exists the γ-phase throughout the series of specimens. The carbide change point on heating, taken from the quenched specimens, was lower than that taken from the annealed specimens; the difference in the temp. of the Ac_1 point became larger as the quantity of Cr increased. The quantity

of heat absorbed at the Ac_1 point, when the quenched specimens were tempered, was smaller than that when the annealed specimens were heated; the difference became larger as the quantity of Cr increased. The soaking time, under which the specimens were exposed at 980°, had no influence on the position of the Ac_1 point or on the quantity of heat absorbed at that temp. Neither the annealing nor the quenching of the specimens had any appreciable influence on the A_2 point. The lowering of the carbide change point on cooling, which imparts the self-hardening property to the steel, is due to the retardation of the deposition of the re-formed carbide from the supersatd. solid soln. C. J. West

Rare metals. Anon. *Metallurgist* (Suppl. to *Engineer* **146,** No. 4) 98-9(1928).—Detailed studies of rare metals may prove of practical importance. Study of Be has indicated possible com. use as an alloy with Cu and discovery of new sources has followed. D. B. Dill

The superheating of aluminum. J. Suhr. Cie. Alais, Froges et Camargue. *Chimie et industrie* Special No., 392-6(April, 1928).—Superheating of Al to over 950° (max. used in the tests 990°) completely eliminates any Na which might accidentally be present and also any inclusions from the electrolytic bath which might have been held in the Al due to rapid cooling when it was poured. When Al having poor mech. properties is remelted and held at 730-830° for 3 hrs., there is but little or no improvement in properties; but if it is held at 900-35° for the same length of time and then poured at 730°, the properties are greatly improved and become normal. Al which had been improved by superheating to 935° was poured at temps. of 790°, 850°, 910°, 940° and 990°, the rates of pouring being decreased as the temp. was increased, and in each case part of the metal was allowed to cool and was poured at 730°. The mech. properties (elastic limit, tensile strength and elongation) were identical for all pouring temps., and in no case were blowholes observed. Though the tendency of Al to absorb gases increases with temp. of melting, this can be entirely offset in practice by increasing the time taken for pouring as the temp. increases, so as to allow the dissolved gases to escape during the cooling period. A. Papineau-Couture

The spectrography of alloys by means of x-rays. M. H. Weiss. *Bull. soc. chim.* **43,** 697-711(1928).—A review. A. J. King

Aluminum alloys. Zay Jeffries. *Mech. Eng.* **50,** 684-6(1928).—Standard alloys of Al for sand casting, pressure die casting, permanent-mold work and forgings are tabulated, showing compn., tensile strength, elongation and Brinell hardness no. The same phys. properties of four alloys cast in sand and permanent molds are shown after heat-treating. Downs Schaaf

Aluminum and aluminum alloys in the chemical and allied industries. J. Dornauf. *Z. angew. Chem.* **41,** 993-1001(1928). E. H.

The welding of light alloys. J. Isoré. *Aciers spéciaux* **2,** 357-63(1927); *Chimie et industrie* **20,** 56(1928).—Welding of Al presents the drawback of greater corrosion at the weld, which has been shown to be due to impurities and to a modification of the structure of the metal at the weld, while the flame itself has no chem. action when excess of C_2H_2 is present. Welds which are to be exposed to acid fumes, or even only to sea air, should be prepd with the very highest-grade materials. In welding Al, strains and deformations are best avoided by heating the whole piece to be welded to about 400°; a non-oxidizing flame should be used, and the size of the blow-pipe should be increased very rapidly with the thickness of the sheets to be welded. The oxy-acetylene welding of duralumin is not impossible, but is a delicate and expensive operation. Mg can be welded with the same chloride, fluoride and alkali bisulfate fluxes as for Al, but NH_4Cl and MgF_2 should also be added. A. Papineau-Couture

(The mechanical and physical properties of) light and ultra-light alloys in the working temperature range of airplane motors. C. Grard. Service Technique et Industriel de L'Aéronautique. *Chimie et industrie* Special No., 382-5(April, 1928); cf. G. and Villey, *C. A.* **22,** 751.—The tensile strength, elastic limit, elongation, Brinell hardness and d. of light (Al and its alloys) and ultra-light (Mg and its alloys) metals are tabulated, and the elec. and thermal conductivities of Al and Mg contg. increasing amts. of Cu (up to 12%) are plotted. *Conclusions.*—Cast Al contg. 12% Cu is at present the standard alloy for airplane motor pistons, and experience has shown its behavior at the working temp. (330-20°) to be satisfactory. Forged Mg contg. 4% Cu has better mech. and thermal properties than the alloy at present in use, and also a considerably lower d. (1.86 instead of 2.95) and the disadvantage of having to forge it (the mech. properties of the cast alloy being inferior) would be more than compensated by the benefits above mentioned. Two forged alloys (Mg 94, Cu 4, Al 2; Mg 94, Cu 2, Al 4%) have remarkably good mech. properties, but a lower thermal cond., and would

be suitable for parts working at a lower temp. (*e. g.*, crank-cases) on account of their lightness, hardness and resistance to shock. A. Papineau-Couture

Die-casting alloys of low melting point. T. F. Russell, W. E. Goodrich, W. Cross and N. P. Allen. Sheffield Univ., England. *J. Inst. Metals* (advance copy), No. 473, 15 pp.(1928).—Two series of Zn-base alloys were investigated, one contg. Cu up to 3.7%, Sn up to 22% and less than 1% Al, and the other contg. Al up to 4.6% and Cu up to 7%. Flat die-cast tensile test specimens showed 50% greater tensile strength when the shoulder radius was 2 in. than when it was 1/4 in. The size of gate and pouring temp. (if not over 80° above the mushy stage) had little effect on the tensile strength. Slow operation of the lever of the casting machine gave slightly stronger and denser castings. Tensile strengths up to 23 tons per sq. in. were obtained, axial loading being essential. For hardness testing, the Vickers diamond pyramid machine was found more reliable than the Brinell or Rockwell machines. The hardness of these die-castings had no relation to the strength. Transverse results were more dependent on porosity. Comparative brittleness may be estd. from twisting tests, the alloys contg. Al being better in this respect than those contg. Sn. The addn. of Ni increased casting difficulties, but Cd was a benefit. Changes in dimensions of Zn-base die-castings on aging were variable, even with const. shape of casting. The Al-Cu-Zn alloys did not change more than the Sn-Cu-Zn alloys. Changes in air were very slow. In steam, chem. action caused more rapid changes. There was first a contraction, different for different castings, and then a more const. expansion. Part of the expansion was due to surface oxidation, and part to constitutional changes and intercrystalline oxidation. Porosity increased the growth. Rods of various steels and cast Fe were held in molten Zn and the reduction in diam. measured. Cast Fe and high-C steel were corroded more than soft steel. Calorizing gave perfect protection, but Ni plating and Cr plating did not protect. Some of the Ni-Cr steels were more resistant than plain steels. Geo. F. Comstock

The equilibrium diagram of the copper-silicon system. Kanji Matuyama. *Sci. Repts. Tôhoku Imp. Univ. 1st Ser* 17, 665-73(1928).—Thermal analyses, microscopic examn. and elec. resistance measurements were made on 30-g. specimens of Cu-Si alloys covering the entire system, and a new equil. diagram up to 30% Si is presented. The 4 branches of the liquidus correspond to the sepn. of 3 solid solns. and Si. A max. occurs with 12.9% Si at 865°, indicating a compd., Cu_5Si. Eutectics occur at 10% Si and 828°, and at 17% Si and 805°, the latter appearing in all alloys between 14 and 100% Si. A peritectic reaction occurs at 860° in alloys between 5.9 and 7.9% Si. The app. used for the detn. of elec. resistance is illustrated and described. The soly. of Si in Cu was found to be 5.9% at 800° and 4.9% at room temp. Beta formed by the reaction at 860°, decomposes at 795° into a eutectoid, contg. 8% Si, of gamma and alpha. Gamma or the compd. Cu_6Si (8.17% Si) is also formed at 800° by reaction between beta and delta, and has an allotropic change at 738°. Delta, based on Cu_5Si, contains 11.5 to 14% Si at 800°, but only 12.2 to 13.2% at room temp. Twelve photomicrographs of typical structures are presented and discussed. G. F. C.

Silicon-aluminum cast alloys. J. Dornauf. Frankfurt A. M. *Z. Metallkunde* 20, 289-92(1928); cf. *C. A.* 22, 210.—The influence of added Si, Fe, Mg, Mn, Cu, Zn, Sn and Sb upon the Al-Si eutectic alloy "silumin" was studied. In the Al-Si alloy as the Si content rises the tensile strength increases until with 12-14% Si it reaches the max. of 18-23 kg./sq. mm. At this point the elongation is 5-10%. The eutectic point lies at 12.8% Si, and in this vicinity the best physical properties are obtained. Above 14% Si there is a rapid loss in tensile strength and increase in hardness. Up to an Fe content of 0.8% the tensile strength is not appreciably affected, but with Fe from 1.0 to 1.5% this falls to under 15 kg./sq. mm., and elongation is less than 1%. Less than 1% Mg exerts considerable influence upon the mech. properties of silumin. With 4% Mg tensile strength is about 14 kg./sq. mm. and elongation about 1%. Ca exerts about the same effect as Mg. Mn content of 0.1 to 0.4% has a beneficial effect upon the refining process. Above 1% tensile strength and elongation fall, being about 14 kg./sq. mm. and 2.5% at 3% Mn. With 5% Zn tensile strength is 16-17 kg./sq. mm. and elongation 3%. Addition of 0.6-0.8% Cu to silumin increases the dynamic elastic limit about 80%, resulting in an increase in fatigue strength. With 2% Cu tensile strength is about 16 kg./sq. mm., elongation about 1%. Sn has a very unfavorable effect. With 0.2% tensile strength is only 16 kg./sq. mm. and elongation 2-3%. With 4% Sn tensile strength and elongation are about 13 kg./sq. mm. and 2.5%. Sb, Ti and Ni have about the same effect as Sn. About 5000 commercial samples of silumin are tested, 75% showing tensile strength of 18 kg. per sq. mm. and over. In the refinement of Al-Si alloy, the addition of a small quantity of Na is helpful. H. S.

Shrinkage and surface strains in hard-drawn wires of copper, aluminum, aldrey and aludur. H. Bohner. Lautawerk (Lausitz). *Z. Metallkunde* **20**, 286-8(1928); cf. *C. A.* **22**, 2543.—The behavior of wires of Cu, Al, aldrey and aludur under the influence of heat treatment was studied. Apparatus is described for detn. of thermal expansion. As the temp. is raised a point is reached at which the sample commences to shorten if the heating is continued, and when it is cooled a permanent shortening has occurred which is greater the higher the temp. of heating has been and the longer the heating has continued beyond the point of max. expansion. For Al, aldrey and aludur shortening commences at 200-250°, for Cu at about 500°, for bronze at about 360°. The max. expansion for Cu is about 0.9%, for bronze about 0.8%, for Al about 0.5%, for aludur about 0.7%, for aldrey about 0.56%. The permanent contraction obtained for Cu is about 0.3%, for bronze about 0.25%, for Al about 1.4%, for aldrey about 1.0%, and for aludur about 1.0%. Shortening is attributed to shrinkage of the surface of the wire as a result of the effect of surface strains, which at certain temps. become greater than the strength of the wire. Recrystn. is produced with the formation of large grains and a reduction likewise of elec. cond. H. Stoertz

The binary systems: cadmium antimony and cadmium lead. E. Abel, O. Redlich and J. Adler. Tech. Hochschule, Wien. *Z. anorg. allgem. Chem.* **174**, 257-68(1928).—In the binary system Cd-Sb, 2 compds. exist CdSb and Cd_3Sb_2, but the latter is unstable and on cooling the melt is transformed into CdSb. With alloys above 33 atomic % Sb, this transformation is indicated by sudden increases in temp. as the alloy is cooled, while with less than 33 atomic % Sb this self heating is not evident and the transformation to CdSb is slower. Between 40 and 50 atomic % Sb a eutectic of CdSb and Cd exists. In the system Cd-Pb it is shown that Cd and Pb are practically insol. in one another in the solid state. Values are given in a table for the log of the activity coeff. $\gamma = a/N$, in which N = molar fraction. Thus with $N_{Cd} = 5$, $\log \gamma_{Cd} = 0.819$ and $\log \gamma_{Pb} = 0.008$, with $N_{Cd} = 25$, $\log \gamma_{Cd} = 0.471$ and $\log \gamma_{Pb} = 0.060$; with $N_{Cd} = 50$, $\log \gamma_{Cd} = 0.243$ and $\log \gamma_{Pb} = 0.195$; with $N_{Cd} = 75$, $\log \gamma_{Cd} = 0.087$ and $\log \gamma_{Pb} = 0.465$; with $N_{Cd} = 95$, $\log \gamma_{Cd} = 0.008$ and $\log \gamma_{Pb} = 0.989$. These values are in good agreement with W. N. Taylor's. H. Stoertz

The ternary system: lead-antimony cadmium. E. Abel, O. Redlich and J. Adler. Techn. Hochschule, Wien. *Z. anorg. allgem. Chem.* **174**, 269-80(1928).—The ternary alloys were prepd. by adding various quantities of Pb to 6 previously prepd. binary Sb-Cd alloys. The system (examd. thermally and micrographically) can be divided into 2 ternary half systems sepd. by a quasi-binary section Pb-CdSb, on one side of which only Sb, Pb and CdSb are present as solid phases, and on the other side of which only Cd, Pb and CdSb are the solid phases. The quasi-binary section has a compn. in atomic % of 85.6 Pb, 7.2 Sb and 7.2 Cd located at 275°, while the Pb, Sb, SbCd eutectic is located at 242°, with the compn. in atomic % of 80.1 Pb, 17.7 Sb, 2.2 Cd and the Pb, Cd, SbCd eutectic is located at 236° with the compn. in atomic % of 68.2 Pb, 3.8 Sb and 28.0 Cd. H. Stoertz

Volume change of manganese during solidification. Yoshiharu Matsuyama. *Bull. Inst. Phys. Chem. Research (Tokyo)* **7**, 731-3, English Ed. **1**, 65.—The vol. change of metallic Mn accompanying solidification was measured by means of a thermobalance. It was found that Mn contracts during solidification by 1.7% of its vol. E. J. C.

The variation of the standard of silver and copper alloys fused in contact with air. Guichard, Clausmann and Billon. *Bull. soc. chim.* **43**, 752(1928).—Alloys of Ag and Cu, when fused in the air, often show a change in wt. An alloy, 72.1% Ag, heated at 1000° for 2 hrs., was found to have become 74% Ag. The alloy, heated at 1300° to 1400°, had its Ag content reduced to 71.5%. There are two opposing influences, the one a disappearance of Cu due to oxidation at the lower temps., and the other the volatilization of Ag at higher temps. An alloy, 89.5% Ag, heated at 1100°, showed no change in compn., both Ag and Cu being removed at the same rate.

E. G. VandenBosche

The deoxidation of cast silver. Guichard, Clausmann and Billon. *Bull. soc. chim.* **43**, 752-3(1928).—The addn. of 0.1% Cu_3P_2 is very effective as a deoxidizer when fusing alloys of Ag and Cu. The qualities of the alloy are improved and a smaller no. of reheatings are necessary in the process of rolling than when the melt is simply protected with a layer of pulverized charcoal. E. G. VandenBosche

The swelling in hydrogen of silver and oxidized copper alloys. Guichard, Clausmann and Billon. *Bull. soc. chim.* **43**, 748-51(1928).—The swelling of Ag and Cu alloys contg. some oxide, when heated in a current of H_2, previously reported (*C. A.* **22**, 2542), is further discussed. Photographs are given of both etched and polished

metals. With alloys contg. a rather large amt of Ag reduction penetrates toward the center of the sample more readily and cracks appear on cooling. E. G. v. B.

Laboratory uses of Monel metal. L. F. Bates and R. C. Brown Univ. College, London. *Nature* **122,** 240(1928).—The phys. properties of the Cu-Ni alloy, monel metal, make it useful for a number of lab. expts. Its low magnetic crit. temp. (100–50°) makes it applicable to illustrate the loss of ferro-magnetism with rise in temp. It has also been used as tips to measure the surface tension of liquids by the drop wt. method, or that of Hg by Jaeger's jet method. In these it is superior to glass because of its resistance to corrosion. H. F. Johnstone

Heusler's alloys. The system manganese-aluminum-copper. Otto Heusler. Inst. phys. Chem. Göttingen. *Z. anorg. allgem. Chem.* **171,** 126–42(1928); cf. *C. A.* **21,** 1215.—H. made a thermal and microscopic study of Mn-Al-Cu alloys, rich in Cu, by fusing together binary alloys of Cu-Mn contg. 15 and 30% Mn, respectively, with varying amts. of Al The areas of separation of ternary α- and β-solid solns. were detd. The β- solid soln. undergoes a change in compn. by the formation of α-crystals and at temps. below 540° breaks up into a eutectoid mixture of α- and γ-solid solns This breakdown is exceedingly slow For the malleable Mn-Al-Cu bronze of compn. (14, 10, 76%) annealing for several weeks at 300° is required to decompose the β-crystals completely. Neither the α-crystals nor the eutectoid mixture of α- and γ-crystals is magnetic. Since cooling curves did not show when the β-crystals become ferromagnetic, H took differential heating curves of samples of the (14, 10, 76) alloy quenched from 700°, first unaged and then aged for different lengths of time at 40°, 80°, 184°, 230°, 300° and higher The thermal data agreed with the results previously obtained by Take (*C. A.* **5,** 1731) who examined the same alloy magnetometrically. There is a heat evolution at temps ranging from 100 to 290° due to the formation in the β-crystals of ferromagnetic molecules (presumably $Al(Mn,Cu)_3$) from the uncombined atoms as a result of the aging process since *quenched* specimens of β-solid solns. are non-magnetic. Heating for 1000 hrs at 300° destroys the β solid soln. completely and the differential heating curve then shows that the thermal effect of the magnetic transformation (below 300°) has completely disappeared H. S. van Klooster

Age-hardened manganese-copper alloys. Fr. Heusler. Dillenburg, Hessen Nassau. *Z anorg. allgem. Chem* **171,** 146–62(1928); cf preceding abstr. H. gives the mechanical properties of some Mn Al-Cu alloys (5, 9, 86 and 13, 9, 78%) and of Mn-Si Cu alloys (12, 3, 85%; 8, 2, 90 and 5, 2, 93%) in the sand-cast and in age-hardened condition. An explanation is given of the *ferromagnetism* induced in the Mn-Al-Cu alloy of compn (13, 9, 78%) when age hardened at 80° (cf. *C. A.* **21,** 3880). This change does not produce any visible differences in the microscopic appearance of the etched alloy. Aging at temps. above 80° results in the gradual decompn. of the ferromagnetic β-solid soln into the non-magnetic α- and γ-solid solns. This decompn. is easily demonstrated by the microscopic appearance of the alloy when aged for different lengths of time at 235°. In the appendix E. Donnges presents tables and graphs on the hardness and the elec. cond as a function of temp and duration of aging for hot-rolled bars of 2 Mn-Al-Cu alloys (13, 9, 78 and 5, 9 86%) and one Mn Si-Cu alloy (5, 2, 93%). H. S. van Klooster

Metal protection in galvanizing technic with special regard to the so-called intermediate layers before galvanizing. E. Krause. *Korrosion Metallschutz* **4,** 153–7 (1928).—A review of the present-day methods of electroplating for corrosion prevention with emphasis on the need for intermediate layers to obtain more adherent coatings. B. E. Roetheli

Metal-spraying process and the prevention of corrosion. R. Hoffer. *Chem. Fabr* **1928,** 316 8.—The process consists of the melting of a wire in an oxy-H flame and the atomization of the molten drops by a current of air. Plated surfaces not more than 0.02 mm. thick and of reasonable strength can be made in this way. It is essential that the droplets should be hot when they strike the surface to be plated, and that the latter should be roughened. All metals can be sprayed which m. below 1600° and are available as wire. The surfaces produced are, however, porous, and the process is only useful when they can be improved by chem. or mech. means. In the case of Fe covered with Zn, the porosity is no disadvantage, as the Zn acts as an elec. protector. Al coatings have found an extended use. The plated material is heated in absence of air, when alloying at the surface of contact takes place and the coating becomes non-porous. A partly alloyed Al coating, especially with an addnl. Zn coating, is a good protection against SO_2. A more completely alloyed Al coat is protective against oxidizing gases at temps. up to 1000°. B. C. A.

Acid resistance of pure chromium-nickel-iron alloys. W. Guertler and W.

Ackermann. Berlin-Charlottenburg. *Z. Metallkunde* **20**, 269-79(1928).—A study of the resistance of Cr-Ni-Fe alloys to acid attack with the object of testing Tammann's conclusion that the protection given to an alloy in the mixed crystal series by one of its constituents is greatly increased when the atoms of the protective element equal $^1/_8$ of all the atoms present (*Z. anorg. allgem. Chem.* **107**, 1). The alloys were prepd. from electrolytic Fe, pure Ni powder (Kahlbaum), and alumino-thermally prepd. Cr. After solidification the alloys were heated in a vacuum at 1200° for 4 hrs. Each sample was exposed to the action of 1% and 20% HNO_3, 1% H_2SO_4, 1% HCl, 1% HCl + H_2O_2, 5% AcOH, 5% KOH, 5% KOH + H_2O_2, the extent of the attack being measured by loss in wt. in g./sq. cm./hr. A more rapid method consisted in immersing a polished surface in the acid and observing the beginning of attack under the microscope, the time for etching to appear being taken as a measure of resistance to attack. Results are given in curves. In HNO_3, Fe-Ni alloys show a very strong reduction in attack at 12.5 and 25 atomic % Ni, or at $^1/_8$ and $^2/_8$ of the total no. of atoms in the mol. Cr-Fe alloys show complete passivity above 12.5 atomic %. In the ternary alloys Cr alone seems to produce a protective action, no attack occurring when more than $^1/_8$ of all the atoms are Cr. In H_2SO_4 considerable attack takes place upon the Fe-Ni alloys unless Ni is over 12.5 atomic %. Cr exerts no protective action in H_2SO_4 as in Fe-Cr alloys the attack actually increases at the $^1/_8$ and $^2/_8$ points. With the ternary alloys, protective action occurs when Cr + Ni atoms are at least $^2/_8$ of the total no. of atoms. If less than this amt. is present the alloy is more vigorously attacked than pure Fe. None of the alloys prepd. showed appreciable resistance to HCl, but in the HCl + H_2O_2 mixt. alloys contg. more than 11.74% Cr ($^1/_8$ mol.) become passive. Similar results are obtained in AcOH, the protective action being attributed to the formation of a $Cr(OH)_3$ film by hydrolysis. KOH and KOH + H_2O_2 gave no attack on any specimens. In general it is shown that in oxidizing agents or in such solns. where the formation of an oxide skin is possible, Cr is the protecting element, while in non-oxidizing solns. such as H_2SO_4 the Ni is the element which exerts the retarding influence. H. Stoertz

Corrosion phenomena. XIII. The solution of metals accompanied by hydrogen evolution—the catalytic influence of non-homogeneous metals and their relationship to the overvoltage series. A. Thiel and J. Eckell. *Korrosion Metallschutz* **4**, 121-33, 145-51(1928); cf *C. A.* **22**, 1715.—The soln of metals accompanied by H_2 evolution, the catalytic influence of non-homogeneous metals and its relationship to the H overvoltage series were studied (cf. *C. A.* **22**, 209). Expts were made on the soln of Al in HCl with results similar to those observed with Zn The previous explanation of the "difference effect" (*C. A.* **22**, 209) is claimed to be erroneous in stating that the theory of non-homogeneous metals is linked with the theory of diffusion of residual currents The fact that stirring causes no change in the "difference effect" refutes this explanation. B. E. Roetheli

Methods of corrosion testing with the aid of indicators. Heinrich Thiele. *Korrosion Metallschutz* **4**, 152-3(1928).—The initial progress of corrosion of metals can be followed by use of suitable indicators. Dyes which become colorless on reduction and $FeCl_3$-$K_3(Fe(CN)_6)$ soln. in agar are suitable for non-ferrous metals. Ferroxyl indicator is used for Fe. Since $K_3(Fe(CN)_6)$ is a strong oxidizing agent, only small quantities are used in the agar. The metal is immersed, removed after a short time, and exposed to H_2S or NH_3 vapors. In the case of Cu, the corroded portions appear black or blue, resp. B. E. Roetheli

Electrochemical polarization process for prevention of corrosion in locomotive boilers. L. O. Gunderson. Chicago and Alton R. R. Co. *Ind. Eng. Chem.* **20**, 866-9(1928).—Arsenic added to feed water as a sol. salt is caused to plate out on tubes, etc., by an e. m. f. imposed by headlight generator through the use of iron anodes, with resultant protection to cathodic parts. A discussion of thermally generated currents and their role in corrosion is given. Excellent results are reported from the practical application of this method in locomotive boilers. J. K. Roberts

Investigations regarding the action of various kinds of ethyl alcohols on sheet aluminum and Lautal. H. Röhrig. *Korrosion Metallschutz* **4**, 133-5(1928).—Sheet Al and Lautal were immersed for 120 days at 20° and 21 days at 78° in EtOH from various sources. Losses in wt., strength and ductility were measured. The 3 properties changed similarly. Abs. alc. and high-grade alc. were non-corrosive, while raw molasses spirits, spirits from sulfite liquor and raw spirits were increasingly corrosive in the order named. B. E. Roetheli

Electrolytic destruction of pipes. W. B. McCabe. *Commonwealth Eng.* **15**, 475-7(1928).—By comparing the elec. railway and telephone distribution in Mel-

bourne with that in Dublin, it is concluded that in Melbourne considerable destruction in pipe lines is taking place electrolytically. It is suggested that the laying of wood stave pipes is a possible remedy. J. K. ROBERTS

Corrosion in steam heating systems. F. N. SPELLER. *Domestic Eng.* (Chicago) **122**, 23–4, 61–2; *J. Am. Water Works Assoc.* **20**, 158.—Moisture, O, and CO_2 are the essential factors responsible. D. K. FRENCH

Corrosion phenomena on aluminum-bronze pipes, their causes and steps taken for their prevention. A. MERZ AND E. BRENNECKE. *Korrosion Metallschutz* **4**, 136–40 (1928).—Exposing cold-worked Al bronze to alkali chloride solns. in preheaters resulted in failure by pitting in 4 weeks. Microscopic examn. of the metals showed the attack to be centered at grain boundaries and slip bands. The attack was essentially eliminated by heat-treating long enough to permit recrystn. B. E. ROETHELI

The corrosion of iron and its anodic polarization. R. A. DENGG AND H. J. DONKER. *Korrosion Metallschutz* **3**, 241–6(1927).—Current density-e. m. f. curves were obtained for six com. irons of different compns immersed in a soln 0.1 *N* in KCl and 0.1 *N* in K_2CO_3 to det. the effects of compn. on the e. m. f. required to overcome the resistance of the protective film. The e. m. f. required decreases with increasing C content. In the light of the theory of protective film formation in alk. solns. the authors claim that the possibility of having corrosion occur on Fe depends upon the compn. of the electrolyte. Upon immersing an anode in a chloride-carbonate soln. the current at const. e. m. f. falls off with time. The current has 2 functions, strengthening the protective film and satg. inaccessible areas with O_2. A minimum potential is required to start corrosion. If the potential required is between those of O_2 and Fe, corrosion can proceed. If the potential required be higher than that for O_2 in the same soln., no corrosion can take place. Since the Fe assumes the potential imposed upon it by O_2, it is reasonable to suppose that the impurities take on a potential imposed by the O_2. Hence the most detrimental impurity is the one which assumes the highest potential In case of Fe the Fe itself is dangerous. The authors assert that when in contact, the nobler of 2 metals is not always protected when immersed. If the two be brought into contact in a soln. in which the nobler has a smaller penetration potential than the more base, then the former will go into soln. and the latter will behave as cathode. In this case the nobler protects the more base. Noble metals are protected only when the base metal can go into soln. Pitting is explained by weaknesses in the protective film due to irregularities in the structure of the metal underneath. As soon as the film is penetrated the metal goes into soln. decreasing the OH^- concn. surrounding the point of attack, thus accelerating the corrosion. Corrosion occurs at slag inclusions only because of probable differences in the structure of the metal at the slag boundaries. The fact that NaOH gives better protection than K_2CO_3 is not due to OH^- concn. since in solns. of both having the same p_H, the K_2CO_3 is far superior. The method used in this investigation is claimed to give good indication of corrosion conditions occurring in practice. B. E. ROETHELI

Protection of iron structures against corrosion in sea water. HAYSSEN. *Korrosion Metallschutz* **4**, 182(1928).—Materials contg. bitumens were applied to the gates of locks in the Kiel canal. The coatings are in themselves impervious to sea water but by the action of small shell fish, which eat through the coating and deposit a calcareous scale, the metal is exposed to the corrosive action of the H_2O. B. E. ROETHELI

Testing of pickling inhibitors. HEINZ BABLIK. *Korrosion Metallschutz* **2**, 179–81 (1928).—A discussion of the methods in use for testing inhibitors for pickling baths. The importance of detg. relative lengths of time necessary for pickling and the stability of the inhibitor subject to the action of nascent H and heat is emphasized. B. E. R.

Regarding corrosion phenomena. XIV. With reference to the protective effect in the corrosion of iron under steam boiler operating conditions. A. THIEL AND H. LUCKMANN. *Korrosion Metallschutz* **4**, 169–77(1928).—A description is given of a method of corrosion testing of Fe by weighing the H_2O formed from H_2 evolved on heating the metal for extended periods of time in solns. at 100°. Fe was also treated in *N* NaOH solns. contg. varying quantities of Na_2CO_3, NaCl, Na_2SO_4 or Na_3PO_4 in presence of O_2 at 200° in an autoclave. The wt. increase of the metal was measured after 2 hrs. The H_2 evolution data showed 0.01 *N* NaOH to be $^1/_3$ as corrosive as distd. H_2O and 0.05 *N* NaOH $^1/_4$ as corrosive. The presence of air did not appreciably affect the results. The wt. increment data showed the addns. of Na_2SO_4, NaCl and Na_2CO_3 to accelerate corrosion increasingly, while Na_3PO_4 reduced it about 80%. The corrosiveness of the added salt depends upon its concn. The conclusion regarding the known protective influence of Na_2SO_4 is that in solns. in which the concn. of Na_2SO_4 is great enough to form scale a protective film is pptd., and where

the soly. of Na_2SO_4 is not exceeded no protection can be expected. **XV. The results of the work on corrosion in Darmstadt and their relation to the investigations at Marburg.** A. Thiel. *Ibid* 177-8.—An article comparing the contemporary work of the two institutions on boiler water investigations B. E. Roetheli

Corrosion of condenser tubes—"impingement attack"—its causes and some methods of prevention. R. May and H. C. H. Carpenter. *J. Inst. Metals* (advance copy) No. **471,** 35 pp.(1928).—Introduction by C. reviews the work of the Corrosion Research Committee. This investigation deals with the effect of intermittent cavitation of entering water and of air bubbles on the deterioration of condenser tubes. The behavior of protective films was studied by measurement of "film potentials" (f. p.) The potential between test specimen cut from condenser tube exposed to jet and calomel electrode (cathode) was measured with no current flowing, the difference in p. d with the protective film intact and absent being the f. p. A comparison of installed tests with this method showed excellent agreement (f.-p. curves for 70:30 arsenical brass and a 2% Al brass are given). Admission of air in water and scratching had marked effects on the f p. Expts. on an installation of tubes showed that air bubbles alone could cause impingement attack The size of air bubbles is important, very small bubbles producing only slight attack. A jet tester used in the bubble work is described Methods of prevention of impingement attack in condensers are given, including elimination of rotary motion in water boxes, use of grids to reduce cavitation, use of resistant materials, etc.. 70:30 cupro-nickel and 2% Al brass are recommended for resistance to impingement attack. Small increase in CO_2 content of water may remove protective scale from tubes. Also in *Engineering* **126,** 309 12(1928). J. K. Roberts

Corrosion at discontinuities in metallic protective coatings. Ulick R. Evans Cambridge Univ. *J. Inst. Metals* (advance copy) No. **467,** 33 pp.(1928).—Sprayed coatings of Cu, Ni and Al on steel base metal and hot-dipped, electrodeposited, sprayed and sherardized Zn coatings on steel were exposed to various types of atmospheric and submerged corrosion tests. Cracking of the coatings was produced by bending and porosity of sprayed coatings by variations in amt. of metal sprayed on. The tests were by partial immersion in 0.5 *N* NaCl soln, partial immersion in tap water, intermittent spraying with 0.5 *N* NaCl soln, intermittent spraying with 0.01 *N* H_2SO_4, by exposure to air contg SO_2 and H_2O, and by exposure to air contg. HCl. It was concluded: that cracks in coatings produced by bending cause enhanced corrosion of anodic coatings or of base metal in cathodic coatings; that in immersed corrosion, rust is pptd. outside of coat while in atmospheric corrosion the rust ppts. underneath and pushes coating away from steel; that Zn protects exposed steel spots by sacrificial corrosion and hence thick coat is beneficial even though it cracks worse; that Zn builds up protective coating in atm corrosion but not in submerged corrosion; and that Al coatings are less attacked than Zn but give no protection at cracks in Cambridge water Also in *Engineering* **126,** 407 8(1928). J K Roberts

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Metallurgical slags and cements (Anon.) **20.** Fractured boiler plates (Ness, MacCallum) **14.** Technological notes (drying air for blast furnace stoves) (Novák) **21.** Treatment of acid waste from brass cleaning (Sullivan) **14.** X ray analysis of Mg-Al alloys (Westgren, Bradley) **3.** Carrying out gas reduction processes (Norw. pat. 40,145) **13.** Apparatus for testing the weathering properties of steel plates by exposure to water sprays and ultra violet rays (Brit. pat 283,539) **1.** Recovering oil from tin plate (Brit. pat 283,614 **27.**

Ore flotation. Adolphe H Ney. U. S. 1,683,724, Sept 11 A mineral such as Cu ore in the form of an alk pulp is subjected to froth flotation in the presence of the products of reaction of an excess of S_2Cl_2 upon *o*-toluidine or other suitable aromatic amino compds having at least one *o* position to the amino group unsubstituted

Flotation apparatus. Ferd. P Egeberg. Norw 43,996, May 9, 1927.

Treating ores. Quincy Bent, Edwin Barnhart and Frederick W. Wood (to Bethlehem Steel Co.). U. S. 1,684,006, Sept. 11. Mayari Fe ore or other wet ores of plastic character are rendered suitable for a subsequent furnacing operation by feeding the ore into the cool end of an internally and longitudinally ribbed rotary kiln by which the ore mass may be divided into a plurality of integral masses disposed longitudinally of the kiln, the kiln is inclined and is rotated to carry the masses to a point where they become detached and fall during the rotation of the kiln, and the material is heated to effect partial drying in the kiln. An app. is described.

Treating ores and alloys by crystallization. H Skappel. Norw. 43,940, April

19, 1927. Ores, alloys or other metallurgical products are recrystd. in fused, sintered or heated condition under addn. of a substance which will form a part of the eutectic mixt. and which is easily attacked by chem. reagents. After being cooled the mass is treated with a chem. reagent until the said substance is dissolved or decomposed. The mass will then crumble to a powder consisting of different cryst. and amorphous components which can be sepd. in known mech. or chem. ways.

Treating manganese ore. J. C. WIARDA & Co. Brit. 284,098, March 1, 1927. The Mn content of a Mn-bearing ore is reduced to MnO by roasting the finely divided ore in the presence of a gaseous or solid reducing agent, and the ore is then leached with $(NH_4)_2SO_4$ soln. at a temp. of about 80° and liberated NH_3 is recovered. The $MnSO_4$ soln. formed is filtered and cooled and may be treated with the liberated NH_3 to form $Mn(OH)_2$ and regenerate $(NH_4)_2SO_4$. The $Mn(OH)_2$ may be dried and heated to form pure MnO. NH_4Cl also may be used instead of $(NH_4)_2SO_4$.

Reducing iron ores. J. W. HORNSEY and H. E. COLEY. Brit. 284,040, July 26, 1926. Fe ores or oxides are preheated in an inclined rotary chamber and then passed, without access of air, into a second inclined rotary chamber, from which the air is practically completely excluded, where the material is mixed with carbonaceous material contg. hydrocarbons (suitably coal, peat, or lignite) and this chamber is heated to such a temp. that the hydrocarbons are cracked and the products reduce the ore or oxide to practically pure Fe.

Gas reduction of slimy iron ore. AKTIESELSKAPET NORSK STAAL. Norw. 42,213, June 27, 1927. In the gas reduction of highly concd. slime in rotary channel furnaces the materials have a strong tendency to clog together and stick to the furnace lining. The reduction of low-percentage slime works excellently, but the sepn. of the resulting Fe from the gang has been found difficult. Highly concd. slime is therefore mixed with an indifferent refractory substance, for instance, sand. This mixt. works excellently in the furnace and the sepn. of the Fe after the reduction is easy. The addn. substance may circulate in the process.

Extracting metals as carbonyls. I. G. FARBENIND. A.-G. Brit 284,087, Feb. 4, 1927. The process described in Brit. 269,677 (*C. A.* **22,** 1446) for the production of Fe from Fe carbonyl is applied to the treatment of other carbonyls or their mixts., such as Co, Mo or Ni carbonyls or their mixts. with each other or with Fe carbonyl. The carbonyls are preferably introduced into the decompn. chamber in the form of a vapor or mist and solid carbonyls may be dissolved in liquid carbonyls

Casting metals. SAMUEL T. G. SMITH. U. S. 1,683,630, Sept. 11. Powd. $BaSO_4$ is used for facing walls of molds and cores used for casting metals, in order to obtain smooth castings.

Iron castings with a low carbon content. KARL EMMEL and HANS WALBERT (Walbert's interest assigned to Emmel). U. S. 1,683,714, Sept. 11 A cupola furnace using solid fuel is employed for melting a charge of which the "iron portion" consists of at least 50% of iron low in C such as wrought iron or steel and the remainder of iron rich in C such as pig iron of high C and Si content. there are also added admixtures such as are usually employed in the production of gray cast iron and a quantity of coke about 9-13% of the total charge; the charge is submitted to a blast pressure of 400-500 mm water gage pressure which is varied according as the total C content in the product is to be nearer 2% or 3%.

Regenerative open-hearth furnace construction. STEWART J CORT (to Bethlehem Steel Co.). U S. 1,683,656, Sept 11.

Reverberatory furnace for annealing tin plates, etc. W. G. BEESTON. Brit 284,025, Dec 31, 1926.

Aluminum-melting furnace. PAUL H. ROMPH. Can. 283,523, Sept 25, 1928.

Metal coating. FLOYD C. KELLEY (to Can General Elec. Co., Ltd.). Can. 283,034, Sept 4, 1928. A heat protecting face of alloy of Fe-Cr and Si is produced on iron by heating in H in contact with a mixt. of powdered Cr, Si and Al_2O_3 at a temp of 1000°.

Protective coatings for metals and other materials. A. A. VAN DER MEULEN Brit. 283,664, Oct. 28, 1926. A compn. for producing muffle coatings on iron or steel or for preserving wood or stone, etc., comprises phenol 1-2 and linseed oil 40 parts. Siccatives, pigments, etc., may be added.

Zinc coating. JOSEPH G. FITZGERALD and HENRY C. BAKER (to The Central Alloy Steel Corp.). Can. 283,401, Sept. 18, 1928. Fe sheets are coated with Zn by heating the Fe in a Pb bath from 850° to 950° F., coating the sheets in a superheated molten spelter bath, and then controlling the cooling of the hot coated sheets to produce a tight coat of the desired character and appearance. Cf. *C. A.* **22,** 3128.

Pig iron. EMIL EDWIN (to Aktieselskapet Norsk Staal Elektrisk-Gas-Reduktion). Can. 283,386, Sept. 18, 1928. Synthetic pig iron is made by reducing Fe ore at low temp. into spongy Fe, sepg. the latter from harmful constituents by dressing, adding relatively pure carbonaceous material to the spongy Fe, smelting the charge in an elec. furnace under acid conditions and at as low a temp. as possible and adding to the fused bath required quantities of Si, Mn and like elements to obtain the desired grade of pig iron.

Aluminum sulfide. HARALD SKAPPEL. Norw. 44,467, Oct. 10, 1927. An impure raw alloy of Al contg. Fe, Si and Ti is brought to reaction with a suitable amt. of heavy-metal sulfides resulting in the *reduction of heavy metals* for instance Zn and Fe and the formation of pure Al_2S_3 which is worked by known methods for the production of *pure Al*.

Converting zinc dust into liquid zinc. AKTIESELSKAPET MALMINDUSTRI. Norw. 44,762, Jan. 16, 1928. Mech. features of app.

Alloy. STANLEY M. NORWOOD (to The Electro Metallurgical Co. of Can., Ltd.). Can. 282,700, Aug. 21, 1928. An alloy contains Cr 20–30%, Ni 6–12%, Si 1–2.5%, Mn 1–2.5%, C less than 0.3%, with the rest Fe.

Bearing-metal alloys. FIRM OF J. NEURATH. Brit. 283,862, Jan. 17, 1927. The bearing-metal alloys described in Brit. 238,895 (*C. A.* **20,** 1976) are modified by the addn. of about 0.5–3.5% of Cd or In or both. An alloy may, *e. g.*, be formed of Pb 66.8, Sb 25, Sn 5, As 1.2 and Cd or In 2%.

Magnetic alloys. H. F. PORTER. Brit. 283,931, Jan 20, 1927. An alloy suitable for use in transformers, relays, armatures, vibrators and similar app. comprises Fe 35–55, Ni 35–55 and Cu 3–10%. The alloy may be formed by melting, in an elec. induction furnace, a charge formed of alternate sheets of Fe and Ni superposed on top of either a Cu-Mn, Cu-Mg or Cu-Mn-Mg alloy or Cu superposed on Mn or Mn and Mg.

Magnetic alloy. WILLOUGHBY S. SMITH and HENRY J. GARNETT. Can. 283,451, Sept. 25, 1928. An elec. conductor produced from an alloy contg. Fe 14 to 15, Cu 14 to 16%, a deoxidizing metal not greater than 0.5%, and the remainder Ni is heat-treated to a temp. in excess of the magnetic change point of the alloy and cooled so that the initial permeability of the alloy is of the order of 6000. Cf. *C. A.* **22,** 939, 2917.

Aluminum alloys. T. GOLDSCHMIDT A.-G. Brit. 283,927, Jan. 20, 1927. Al alloys are formed contg. Mg silicide 1.3–1.7, Cu 1–1.4 and Ti 0.3–0.7%, with or without Mn 0.5–1.1%, and are improved after working, by heating at 520–550°, quickly cooling and aging at 110–160° for 6–24 hrs.

Aluminum alloys. J. STONE & CO., LTD. AND H. J. MAYBREY. Brit. 283,760, Feb. 26, 1927. In treating Al alloys, especially those contg. a substantial proportion (suitably 11%) of Si, B or its oxide or other B compd. such as borax is brought into exothermic reaction and in such state is used for treating the alloy; *e. g.*, the alloy may be melted and added to a pot contg. a reacting mixt. of Al, borax and $KClO_3$.

Aluminum alloys. P. BERTHELEMY and V. H. DE MONTBY. Brit. 283,926, Jan. 20, 1927. In modifications of alloy production as described in Brit. 252,028 (*C. A.* **21,** 1442): (*a*) the proportion of substances foreign to the Al may be held within definite and very narrow limits; (*b*) a rich alloy may be produced from a material contg. Cu such as cupro-Mn, cuproferro-Si or curpro-W; (*c*) the rich alloy may be incorporated in a mass of "French Al" of 99–99.5% purity; and (*d*) an alloy of Al, Mg and Cd may be finally added.

Alloys containing copper, nickel and zinc. R. K. HEZLET and R. GENDERS. Brit. 283,994, Oct. 16, 1926. Cu-Ni-Zn alloys contain also up to 2.5% of Al (the Ni and Al together being more than 15%). An alloy may, *e. g.*, be formed approx. of Cu 50, Zn 30, Ni 20 and Al 0.2–0.3%. Mech features of casting the alloys are described.

Alloy containing nickel, copper and tin. SEWELL E. WINSLOW (to Consolidated Ashcroft Hancock Co.). U. S. 1,683,749, Sept. 11. See Can. 271,976 (*C. A.* **21,** 3596).

Nickel alloys. RUSSELL FRANKS and BURNHAM E. FIELD (to Haynes Stellite Co.). U. S. 1,684,131, Sept. 11. Alloys which are suitable for "high speed" tools are formed of Ni together with Al 3–5, Si 3.5–6, W 5–12, Ti 6–12, and B in effective quantity up to 1%. Cf. *C. A.* **22,** 3128.

Lead alloy. HIROSHI YOSHIKAWA. Can. 283,382, Sept. 18, 1928. A Pb alloy contains Bi less than 10% and Cu less than 10%. Cf. *C. A.* **22,** 3624.

Treating lead alloys. STANDARD ELECTRIC A. S. Norw. 44,471, Oct. 10, 1927. The hardness and the tensile strength are very much increased in an alloy contg. about 97.5% Pb and 2.5% Sb by heating to 240° for 72 hrs., cooling in water and storing at

room temp. for 72 hrs. for ripening. A similar treatment is adaptable also to Pb-Sn and other Pb alloys.

Heat treatment of steel rails. NARAINA D. CHOPRA and FREDERICK J. BULLEN. Can. 282,943, Sept. 4, 1928. Steel rails are heated from a temp. below the lowest change point to a temp. above the highest change point of the steel, then cooled gradually to a temp. just below the lowest change point, and finally cooled rapidly. The heating and gradual cooling are effected in presence of a mixt. of CaO and ash carrying a small proportion of free C and steel turnings. The quantity is equiv. to 10% to 50% by wt. of the combined quantities of CaO and ash and the C content of the ash is such that the quantity of free C present is equiv. to 4 to 20% by wt. of said combined quantities. Cf. *C. A.* **22,** 1568.

Solder. H. MOCK. Brit. 284,001, Oct. 18, 1926. An easily disruptible solder suitable for sealing cans of foodstuffs comprises Pb 60, Sn 20 and Bi 20%.

Electrodes for arc welding. E. W. SCHWARTZ and F. R. KAIMER (to British Thomson-Houston Co., Ltd.). Brit. 283,582, Jan. 15, 1927. Electrodes are made with a relatively thin cond. coating comprising red oxide of Fe, lime or $CaCO_3$ or both, and Na silicate. The coating may be applied by boiling reels of electrode wire for 5-8 hrs. in an aq. mixt. of the coating substances.

Welding electrode. NORMAN B. PILLING and JOHN G. SCHOENER (to The International Nickel Co Inc.). Can. 283,068, Sept. 4, 1928. A welding electrode comprises a malleable Ni or Ni alloy contg. Ni, C, Mn and Mg having associated therewith a coating comprising a Ti alloy and a Ca alloy having the Ti and Ca in the proportions of 19 and 6%, resp., by wt. of the coating, the Ti alloy and the Ca alloy being maintained in coöperative relation to each other and to the electrode by a shellac binder. Cf. *C. A.* **22,** 3625.

Electrodes for arc welding. P. P. ALEXANDER (to British Thomson-Houston Co., Ltd.). Brit. 283,483, Jan. 10, 1927. Metal electrodes of low C content are used in the presence of a hydrocarbon that will dissoc. in the arc and thus provide a protective atm. of H and liberate free C, which will impart characteristics to the weld similar to those of the "parent metal." Propane or natural gas may be used for this purpose and CO_2 or N may be added to vary suitably the compn. of the gaseous mixt. An app. is described. Cf. following abstract.

Electric welding. PETER P. ALEXANDER (to Can. General Elec. Co., Ltd.). Can. 283,039, Sept. 4, 1928. Welds are carburized by producing about the elec. arc a gaseous mixt. of a hydrocarbon and N, the hydrocarbon being dissociable in the arc to produce H and free C, the proportions of the H and N being such that a sufficient amt. of H is present to neutralize the effect of the O of the atm. in welding in the open air. Cf. preceding abstract.

Electric welding. PHILIP K. DEVERS (to Can. General Elec. Co., Ltd.). Can. 283,040, Sept. 4, 1928. Ductile welds are produced by the elec. arc process, by enveloping the arc and molten portions of the work with an active reducing gaseous medium comprising H dild. with N and A.

Electric welding. PETER P. ALEXANDER (to Can. General Elec. Co., Ltd.). Can. 283,035, Sept. 4, 1928. Ductile welds are produced by maintaining an elec. arc between a pool of molten metal on the work to be welded and a welding pencil of metal to be deposited on the work and applying a stream of a gaseous mixt. comprising sufficient H to surround the arc and in contact with the molten metal to exclude atm. air and exert a strong reducing action on the molten metal.

Autogenous welding. JOSEPH W. MEADOWCROFT (to Edward G. Budd Mfg. Co.). Can. 283,239, Sept. 11, 1928. A cleaned filler body of Al is coated with a flux consisting of 3.00% K_2CO_3, 3.70% KCl, 6.90% LiCl, 7.20% K_2SO_4, 20.00% $Na_2B_4O_7$, 21.00% $B(OH)_3$, 38.20% Na_2CO_3 mixed with H_2O and brought to the consistency of light cream.

10—ORGANIC CHEMISTRY

CHAS. A. ROUILLER AND CLARENCE J. WEST

The centenary of Wöhler's synthesis of urea. A. WOHL. *Z. angew. Chem.* **41,** 897-902(1928). E. H.

The action of columbium and tantalum pentachlorides on organic compounds. II. H. FUNK AND K. NIEDERLÄNDER. *Ber.* **61B,** 1385-8(1928); cf. *C. A.* **22,** 1577.—The action of these chlorides on the aromatic hydrocarbons benzene, naphthalene, tetrahydronaphthalene and anthracene gives HCl and intensely colored compds., not cryst.

Compds. prepd. were: $TaCl_4.C_6H_5$, $C_6H_6.3CbCl_5$, $TaCl_5.C_{10}H_8$, $TaCl_4.C_{10}H_7$, $TaCl_3$-$(C_{10}H_7)_2$, $CbCl_4.C_{10}H_7$, $CbCl_3(C_{10}H_7)_2$, $TaCl_4C_{10}H_{11}$, $TaCl_3(C_{10}H_{11})_2$, $TaCl_5.C_{14}H_{10}$, $TaCl_4.C_{14}H_9$, $TaCl_3(C_{14}H_9)_2$, $CbCl_4C_{14}H_9$. The similarity of some of these compds. to those previously prepd. (*C. A.* **22**, 1577) from O-contg. org. compds. leads F. and N. to believe that metal-C bonds exist there also. They present the view that these Cl-contg. compds. hydrolyze with aq. NH_3 and that the weakly acidic compds. thus formed give NH_4 salts G. R. YOHE

Evolution of acetylene from calcium carbide by the action of water, hydrogen sulfide and hydrogen chloride, in the liquid and gaseous conditions. E. BIESALSKI AND H. VAN ECK. *Z. angew. Chem.* **41**, 278-82(1928).—The extent of the gas evolution depends on the extent to which the reacting vapor is absorbed by the carbide, and on the degree to which the solid products formed protect the remaining carbide from further attack. Dry steam decomps. 20% of the carbide present in 2 hrs. at 130°; at 450° there is no attack. This is due to the formation of C by dissocn. of C_2N_2, the C protecting the carbide from further attack. H_2S and HCl both react exceedingly slowly in the gaseous state; even the liquefied gases react very slowly, since in both cases the solid products protect the carbide from further attack. B. C. A.

Behavior of calcium carbide toward free halogens and sulfur. E. BIESALSKI AND H. VAN ECK. *Z angew. Chem.* **41**, 720-3(1928); cf. preceding abstr.—Br and CaC_2 react slowly at the ordinary temp., about 80-90% of C_2Br_6 being formed after 3-5 months. At higher temps. little or no C_2Br_6 is formed, the carbide being decompd. with production of free C. Low temp. favors the production of C_2Cl_6 from CaC_2 and Cl, although the yield is small (3-5%). A certain amt. of C is produced, but the carbide is attacked very slowly, 80-90% remaining after 6 months Very little reaction occurs between I and CaC_2 at the ordinary temp , but 35-37% of $CI_2:CI_4$, together with considerable amts. of free C, is obtained after heating at 100-160° in sealed tubes for some hrs. A 20% yield of CS_2 and much C are obtained when CaC_2 and S are heated at 270°. Traces only of CS_2 are formed at 500° The 1st reaction, which is probably preceded by adsorption, is the formation of Ca halide or sulfide and C The latter can either polymerize or react with the agent to form halogen compds. or CS_2. The yield of halogen compd or CS_2 is detd. by the rates of the 3 reactions concerned. If the polymerized C accumulates the carbide becomes coated with a layer of C and the 1st reaction is prevented. The formation of a layer of Ca halide may also prevent further attack on the carbide. This latter effect is not of considerable magnitude with Br and I, since these readily form complex compds. with the corresponding halides. B C. A.

Methanol from hydrogen and carbon monoxide. RALPH L. BROWN AND A. E. GALLOWAY. Bur. of Mines. *Ind. Eng. Chem.* **20**, 960-6(1928) The exptl. production of MeOH from H and CO has been studied, with ZnO, basic Zn chromate and normal Zn chromate as catalysts The last 2 are more active than ZnO, and under high temps and pressures the normal chromate is the most active With the theoretical mixt. of CO and H at 400° and 180 atms., a 20% conversion of CO to MeOH has been obtained T S. CARSWELL

Citronellol and rhodinol. II. V. GRIGNARD AND J. DOEUVRE. *Compt. rend.* **187**, 330-4(1928); cf. *C. A.* **22**, 3879.—The essence from Bourbon geraniums or roses gives on vacuum distn. a so-called geraniol-rhodinol fraction (I), b_{18} 116-22°. On treatment with BzCl at 150° the geraniol (II) is destroyed, and the remaining product, which is a benzoic ester, is sapond to give a so-called rhodinol, b_{18} 118-9.5°, d^4_{15} 0.860, n^{15}_D 1.4574, $[\alpha]^{17}_D$ 1° 52'· allophanate m , 105-6°. Similar treatment of I with $C_6H_4(CO)_2O$ gives another so-called rhodinol, b_{17} 117-8.5°, d^4_{15} 0.864, n^{15}_D 1.4601. These so-called rhodinols are simply citronellol in which the treatment used to destroy II has caused isomerization. In *d*-citronellol ozonization shows 24% α form; treating it with BzCl converts it to 39% α-form Thus the rhodinol of Barbier and Bouveault is believed to be only a mixt. of α- and β-citronellol. D. H. POWERS

The allyl series. VENANCIO DEULOFEU. *Anales asoc. quim. Argentina* **15**, 418-22(1927).—Allyl acetate was prepd. first by Zinin (*Ann.* **96**, 361(1855)) from allyl iodide and AgOAc. No other method appears in the literature.
for investigation of its

... washed with dil. Na_2CO_3, then with concd. $CaCl_2$ and finally dried over $CaCl_2$ (yield 73%). It b. 103-5°. *β,γ-Dibromopropyl formate*, $HCO_2CH_2CHBrCH_2Br$, not hitherto prepd., was obtained from Br in CS_2 and allyl formate. These esters of $BrCH_2CHBrCH_2OH$ are interesting as a basis of prepn. of

unsym. glycerol esters unless transposition occurs. Thirteen g. of allyl formate in 65 cc. of CS_2 was treated with 40% Br in CS_2 with cooling until the color persisted for 8 to 12 min., forming the $HCO_2CH_2CHBrCH_2Br$. A few drops of allyl formate was added to discharge the color, the CS_2 evapd. on a water bath, and the residue distd. at 221–3° as an oily liquid, heavier than H_2O and of characteristic, irritating odor. The acetate, prepd by Aschan (*Ber.* **23,** 1827(1890)) from Ac_2O and the alc., and by Bancroft (*C. A.* **13,** 1856) from Br and allyl acetate, was made by treating 20 g. of allyl acetate in CS_2 with Br as above, distg. off the CS_2 on a water bath and continuing the distn. at ordinary pressure at 226.5–9°, giving a heavy liquid of irritating odor. For analysis of these compds. the Stepanov method (*C. A.* **1,** 397) with slight modifications was used. E. M. Symmes

Use of magnesium alcoholates in the preparation of ethers. V. Cerchez. *Bull. soc. chim* **43,** 762–7(1928).—*Mg amalgam* is prepd. by heating 24 g. of Mg with 364 g. of Hg under anhyd conditions. After cooling, 3 mols. of ROH is added; after several hrs. there are formed white crystals of ROMg. *Mg alkoxides* of *Pr* (I), *Bu* (II), *iso-Am* (III), *octyl* (IV), *cyclohexyl* (V) and *benzyl* (VI) *alcs.* have been thus prepd. Ethers are prepd. from these by heating in a salt-water bath until the excess alc. boils and slowly adding 2 mols. of Me_2SO_4. Heating is continued for 1–2 hrs., then the product is cooled, poured into dil. H_2SO_4, steam-distd., sepd. and fractionated, the final fractionation being carried out over Na. Yield, 70–80%. *Me ethers* are reported of II, b. 70°; III, b. 90–1°; IV, b. 158° and V, b. 133–5°. The ether of IV must be heated in an oil bath to 120–30° during its prepn.; octene is also formed, decreasing the yield greatly and requiring removal by washing the product with 1% $KMnO_4$. *Et ethers* of I, b. 63.6°, and II, b. 91°, were prepd. by using Et_2SO_4 at 120–30°. Yield, 60%. No ethers of VI could be prepd. A. S. Carter

Formaldehyde. Joseph Coulouma. *Rev. gén. mat. plastiques* **4,** 3–11, 73–85, 152–4, 263–72, 329–35(1928).—A review of its occurrence, function in nature, industrial uses (particularly in the synthetic resins industry), manuf., reactions and detn., with bibliography of 81 references. A. Papineau-Couture

Esters of α-linolenic acid hexabromide (isobutyl, amyl, propyl and isopropyl) from Philippine lumbang oil. Maria Luisa A. Vincente and Augustus P. West. *Philippine J. Sci.* **36,** 73–7(1928).—α-Linolenic hexabromide (I), m. 179.5–80.5°, was prepd. by the bromination of the fatty acids obtained by the sapon. of lumbang oil. With the corresponding alcs. I gives the following esters: 56% iso-Bu (II), m. 136–8°; 46% Am (III), m. 133–5°; 76% Pr (IV), m. 144–6°; 66% iso-Pr (V), m. 141–3°. These esters are all sol. in hot $C_6H_4Me_2$, PhMe, $PhCO_2Et$, AcOEt, Me_2CO, $PhCO_2Me$, C_6H_6, $CHCl_3$, CS_2, CCl_4, EtOH and iso-PrOH. II and III are insol. in hot MeOH and petr. ether. IV is sol. in hot MeOH, PrOH, and AmOH and slightly sol. in petr. ether. V is sol. in hot MeOH, PrOH, AmOH and petr. ether. J. S. Reichert

Chlorination of acetic acid. O. Yu. Magidson, I. G. Zilberg and N. A. Preobrazhenskii. *J. Chem. Ind.* (Moscow) **5,** 528–9(1928).—For the purpose of finding the most favorable conditions of chlorinating AcOH to $ClCH_2CO_2H$ the authors experimented with various catalyzers, using glacial AcOH contg. a slight quantity of Ac_2O. The *app.* consisted of a thick-walled flask provided with a reflux condenser and with a Cl tube reaching to the bottom of the flask; the condenser was connected with 2 wash flasks contg. water by means of tubes reaching just above the surface of the water. The operating temp. was that of a steam bath; the accelerating effect of artificial light was not used. At first the effect of *Brückner's compounded catalyzer* (cf. Brückner, *C. A.* **21,** 3345; **22,** 3819) consisting of P, PCl_5 and I was tried out. None of the 3 expts. made with this catalyzer gave satisfactory results. While B. claimed a complete chlorination in 2–3 hrs., the authors found that 20–23 hrs. of chlorination were required to obtain 50–60% of crystd. CH_2ClCO_2H and that the latter was contaminated with I, from which it could hardly be freed after repeated fractionations. The next 3 expts. were made with a catalyzer of *activated C* in the ratio of 30 g. per 687–700 g. AcOH. The yields after 23–37 hrs. of chlorination were 30.4–51% of the theoretical and the CH_2ClCO_2H obtained was characterized by its high degree of purity. Two expts. made on *contact chlorination* of AcOH by passing vapors mixed with Cl through a layer of activated C placed in a tube immersed in an oil bath at 190–200° were unsuccessful: the CH_2ClCO_2H formation was slight and a considerable quantity of AcOH was decompd. into $CHCl_3$, CCl_4, HCl and CO_2. The catalyzing action of *Sb powder* was also tried, by using 10 parts per 500 parts of AcOH; it was found that, whereas Sb greatly facilitates the chlorination of aromatic compds. by introducing Cl into the ring, it has no effect in the chlorination of AcOH. The best results were obtained by the use of *S as catalyzer*. S should be taken in large quantities (about 1–2% of the

AcOH) and should be subjected to a preliminary treatment with Cl for activation. At first S was placed in the flask and heated over a flame till it melted, then Cl was passed into the melted S till most of it was transformed into S_2Cl_2. After cooling, the flask was placed on a water bath, AcOH was added and Cl was passed in. With 600 g. AcOH and 12 g. S the yield was 58% of the theoretical after 15 hrs. of chlorination; with 661 g. AcOH and 12 g. S the yield of CH_2ClCO_2H was 83% after 17 hrs. The products obtained by this operating method had a faint odor of S compds. and were not as pure as those obtained with activated C as catalyzer. In these experiments about 10% of the AcOH was carried away by the current of HCl. Desiring to prevent this loss, the authors contrived a *combined app.* consisting of 2 flasks with 2 condensers, the latter being so connected that, whereas Cl entered the 1st flask, a mixt. of HCl and Cl entered the 2nd flask; the AcOH carried away from the 1st flask was largely retained in the 2nd. After 9 hrs. of chlorination in this improved app. an average CH_2ClCO_2H yield of 47% of the theoretical was obtained in the 2 flasks; thus, while the loss of AcOH was lowered, the speed of chlorination was doubled. The product obtained in the 1st flask was pure and crystd. BERNARD NELSON

A new method of inversion of geometrical isomers by an exothermic reaction: conversion of maleic into fumaric acid. P. NEOGI, SUKUMAR NEOGI AND MANAS P. CHATTERJI. Presidency College, Calcutta. *J. Indian Chem. Soc.* **5**, 279–83(1928).—Work is carried out to det. whether exothermic reactions bring about geometric inversion as postulated by Skraup (*Monatsh.* **12**, 107(1891)). Maleic acid (I) in H_2O was unaffected by passing a stream of SO_2 (II) through the soln. for 0.5 hr. I with MnO_2 (III) similarly showed no change. To I (1.5 g.) in 5 cc. of H_2O finely divided III (2 g.) was added. II was bubbled through the soln. for 5 min. The temp. rose from 27° to 60°. Fumaric acid (IV) sepd. at once in 50% yield and was recrystd. from alc. Keeping the temp. of the suspension at 10° during the addn. of II gave only 10% IV; at 90° a 52% yield was again obtained. When I is dissolved in alc. or Et_2O, III added, and II bubbled in, since II and III do not interact in these solvents, no IV was formed. With dil. alc., IV was formed. When III was replaced by PbO_2 or BaO_2 there was no interaction with II and no IV was formed. I in H_2O at 60° gives no IV. I in H_2O with the reaction products of II and III at 10° and at 60° forms no IV when more II is bubbled in. Inversion of I to IV apparently only occurs when II and III are allowed to interact in its presence. D. H. POWERS

Determination of the spatial configuration of two *cis-trans*-ethylenic isomers. BOURGUEL AND RAMBAUD. *Compt. rend.* **187**, 383–4(1928).—Zal'kind (*C. A.* **8**, 1419) by partial reduction of tetramethylbutinediol (I) with colloidal Pd obtained 2 tetramethylbutenediols, the α isomer (II), m. 76–7°, and the β-isomer (III), m. 69–70°. On dehydration both gave the same γ-oxide, but dehydration was more rapid in the case of II. S. therefore concluded (*C. A.* **17**, 1209) that II was the *cis-* and III the *trans*-form. Bourguel (*C. A.* **19**, 2651) by reduction of I with colloidal Pd obtained only III. B. and R. have made a quant. study of the internal dehydration of II and III, and have arrived at the following conclusions: III is the *cis*-isomer, not *trans*, as stated by S.; II is not a definite compd., but a solid soln. of about 83% of the *cis*-form and 17% of a *trans*-glycol, m. 101°, which B. and R. have isolated and have called γ-glycol. LOUISE KELLEY

The system of simple sugars and α-substituted fatty acids. KARL FREUDENBERG. *Naturwissenschaften* **16**, 581–7(1928).—A review of the configurational relationships of hexoses and their decompn. products. B. J. C. VAN DER HOEVEN

Preparation of glucosides of the α-series: crystallized α-methyl fructoside. HANS H. SCHLUBACH AND GUSTAV A. SCHRÖTER. Univ. Hamburg. *Ber.* **61B**, 1216–22 (1928).—The method of König and Knorr cannot be satisfactorily used for the prepn. of α-glucosides from β'-acetochloroglucose (I) because the I in many solvents, and especially in alcs., rearranges into the α'-compd. considerably more rapidly than it is converted to the glucoside. It seemed indispensable, therefore, to effect the replacement of the halogen by the alkoxy group so rapidly that the rearrangement by the alc. could not occur. K. and K. had found that when they treated their α'-acetobromoglucose with $AgNO_3$ in MeOH AgBr was pptd. immediately and quant. and tetraacetyl-β-methylglucoside was formed instead of the expected acetonitroglucose. For their present work, S. and S. chose Brauns' more readily accessible β-acetochlorofructose (II) instead of I. B. had already applied the K. and K. method to II but obtained only a sirup with a rotation of —4.1°. Repetition of his work gave a sirup with a rotation of 6.8° or, after sapon., of 6.6°. As II is hydrolyzed by H_2O with extraordinary ease to tetraacetylfructose (III), S. and S. tried the effect of binding the H_2O liberated in the K. and K. reaction; with anhyd. Na_2SO_4 and $CuSO_4$ they obtained products with rotations of 16.7° and 22.3°, resp., but they were still sirupy. They next tried $AgNO_3$

in MeOH on the II in Et_2O, neutralizing the liberated HNO_3 with Ag_2CO_3, and for the 1st time were able to obtain crystals of *tetraacetyl-α-methylfructoside* (IV), along with III. As the neutralization of the HNO_3 with Ag_2CO_3 proceeds rather slowly, however, C_5H_5N was substituted for the Ag_2CO_3; this has the further advantage that in neutralizing the HNO_3 it forms no H_2O which might lead to the production of III. To extend the applicability of the method to cases in which the $AgNO_3$ is not sol. in the alc. components, MeCN was tried as the solvent and found to be equally satisfactory. No simultaneous formation of the β-isomer of IV was ever observed. IV, m. 112°, $[\alpha]_D^{20}$ 45.0° ($CHCl_3$, *c* 1.3104); yield, 6.2 g. from 46 g. II. Its sapon. to *α-Me fructoside* (V) is difficult. With $Ba(OH)_2$ the V crystd. after 6 months, with NH_3 in MeOH only after seeding. Unlike the β-compd. it can be purified by crystn. only with difficulty. The higher alcs. (iso-Am, iso-Bu) are the best solvents for this purpose. Because of the long time required for the crystn. the purification has not been carried to completion and the consts., m. 96–7°, $[\alpha]_D^{20}$ 44° (H_2O, *c* 0.9116), are to be considered only as provisional. That the V belongs to the stable fructose series was shown by methylation with alk. Me_2SO_4 to the pentamethylfructose and hydrolysis of this with HCl to 1,3,4,5-tetramethylfructose. The rotation (in CCl_4) of the II changed, on standing 16 hrs. over $CaCl_2$ and KOH at about 8° and 15 mm., from —176.9° to —148°; in various solvents $[\alpha]_D$ after 0, 12 and 37 hrs., resp., was: CCl_4 —176.9°, —176.9°, —176.9°; MeCN —132.9°, —132.9°, . . . ; $CHCl_3$ (D. A. B. VI) —159.1°, —156.6°, —126.7°; MeOH —36.3°, —43°, —37°. C. A. R.

Sulfur sugars and their derivatives. XII. Xanthogenglucose and its cleavage to glucothiose (1-thioglucose). WILHELM SCHNEIDER, RUDOLF GILLE AND KURT EISFELD. Univ. Jena. *Ber.* **61B**, 1244–59(1928); cf. *C. A.* **21**, 1634.—It is suggested that 1-thioglucose and other S sugars with labile, "thiocarbonylic" S be designated as thioses (glucothiose, galactothiose, etc.) to distinguish them from "thioglycoses" in which an alc. sugar HO group is replaced by a SH group with the usual mercaptan properties. The S-contg. glycosides are to be correspondingly classified as "thiosides" with a true thioglycosidic union of the aglycone (*e. g.*, Me glucothioside, hitherto known as Me thioglucoside), and true "thioglycosides," *i. e.*, S-contg. glycosides in which the aglycone is bound through an ordinary *O*-glycosidic union with the sugar (*e. g.*, 3-thiomethylglucoside). S. also retains, in spite of all philological objections, the designations "glucose, glucosides" for dextrose and its derivs. and "glycoses, glycosides" for monosaccharides in general. In connection with attempts to synthesize sinigrin, the prepn. of glucothiose (I) has been taken up again in agreement with Bergmann who observed that acetobromoglucose smoothly reacts with $EtOCS_2K$ to form an acetoxanthogenglucose (II), which yields I on hydrolysis. The II, was obtained in 2 dimorphic forms, the higher melting being the stable form at room temp. Sapon. with alk. reagents, especially NH_3 in MeOH, does not give the free xanthogenglucose (III) but yields I directly, but the Ac groups can be split off, without affecting the xanthogen group, with acids; HCl in MeOH proved best for this purpose but H_2SO_4 in MeOH and even aq. HCl sometimes effected the desired result. The III, $HOCH_2\underline{CH.CH(OH).CH(OH).CH(OH).C}HSCSOEt$, seps. from concd. aq. soln. or, better, from Et_2O satd. with H_2O, with 2 mols. H_2O of crystn. In anhyd. form, it cannot be obtained entirely pure. Towards acids, even in H_2O, it is strikingly stable, and even on boiling with dil. H_2SO_4 in the presence of $CuSO_4$ it only slowly decomps. with formation of $EtOCS_2Cu$. The I obtained from II with NH_3 in MeOH has the same properties as described in earlier papers. In spite of many variations in the conditions of sapon. and isolation, the products obtained never had as high a S content as Wrede's compd. (*C. A.* **16**, 3637), the max. being only around 15%. The C and H values were correspondingly higher, excluding the suggestion, made previously, that the low S content was due to the presence of 1 mol. H_2O. Acetylation of the isolated I or of the sirupy crude sapon. residue always gave amorphous products from which no cryst. pentaacetylglucothiose (IV) could be obtained, indicating that they were mixts. of different Ac derivs. In fact, from such a mixt. was isolated the acetate of diglucosyl disulfide (V). In the hydrolysis with NH_3 in the air, even when carried out rapidly, V seems always to accompany the I in varying but generally not inconsiderable quantities. Surprisingly enough, if air is rigorously excluded during the hydrolysis of the II, the products are still poorer in S (13–4%). In the hydrolysis, as followed optically, the SCSOEt residue is split off with materially greater velocity than the Ac groups. The intermediate tetraacetylglucothiose (VI) could not be isolated as such, but by allowing the hydrolysis at 0° to run only 1 hr., evapg. *in vacuo* and reacetylating

the sirupy residue, IV was obtained almost quant. Attempts to prep. I from the purified IV exactly according to Wrede's method gave no better products than did the hydrolysis of II with NH_3 in MeOH, but with Zemplén's method cryst. alkali salts of I can be obtained with the greatest ease. The *Na salt*, $C_6H_{11}O_5SNa.2H_2O$ (VII), is stable when dried in the air and also in H_2O, even on heating, if air is excluded. Its Na content can be detd. by titration with Me orange but not with phenolphthalein. In H_2O in the air it oxidizes in the course of a few days to V. H_2O_2 effects the oxidation instantaneously; if the destructive action of the excess of H_2O_2 on the V is hindered by faintly acidifying there is obtained a soln. whose max. *l*-rotation approaches within a few % the value found by Wrede for his amorphous V. The Ag compd., obtained from VII with NH_3-AgOAc, resembled in all respects the amorphous prepns. previously obtained from the free I except that after isolation and drying it completely lost its original soly. in H_2O. In freshly prepd. aq. soln. VII is *d*-rotatory ($[\alpha]^{20}_D$ 15.5°) and the rotation does not change if air is excluded. With Ac_2O in C_5H_5N is obtained only β-IV, with EtI only β-Et glucothioside (VIII). The free I shows mutarotation, the rotation, $[\alpha]^{20}_D$ 16.5°, of the soln. slowly increasing to a max. in about 10 days, but even if air is excluded there is distinct decompn. during this long period. In the presence of a slight excess of mineral acid (say, 0.002 *N*), the max. rotation is attained in 3 days and there is no appreciable decompn. (only a minimal cleavage of H_2S could be detected qual.), so that the end value so obtained, $[\alpha]^{20}_D$ 58.4°, may be considered as corresponding to the mutarotation equil. of the α- and β-forms. The rotation of the glucothiose ion, calcd. from that of the Na salt, is 20.1°, the value 16.5° given above for I being the rotation of the I as it exists in soln., chiefly in undissociated form. Higher concns. of free acid affect neither the velocity of the mutarotation nor its final value, and as the Na salt shows no mutarotation it may be concluded that only the undissociated I is capable of rearrangement. When a soln. of I which had attained the mutarotation equil. was evapd. and the residue was acetylated in C_5H_5N, it was found possible to sep. the product by crystn. into 2 fractions, (IX) and (X), the less sol. one (IX) being apparently the known β-IV, while X is a new compd., very probably α-IV. *Tetraacetyl-d-glucose Et xanthogenate* (II) (yield, almost 90%), prisms, m. 88-9°, $[\alpha]^{20}_D$ 30.8° in $(CHCl_2)_2$ (*c* 3.197). At times needles were obtained along with the prisms and occasionally the prisms on recrystn. changed into needles and their m. p. fell. The m. p. of the needles varied from 74° to 89°. The 2 forms do not appreciably differ from each other in compn. and properties. The needles, in contact with their own satd. soln. in alc., change in the course of 1-2 weeks into the prisms, while the latter remain unchanged under the same conditions. *d-Glucose Et xanthogenate* (III), sinters about 87°, m. 92-8°, $[\alpha]^{20}_D$ -50.5° (H_2O, *c* 1.396); the dihydrate, m. 63-5° and slowly weathers in a desiccator, even under atm. pressure. β-IV, m. 119-21°, $[\alpha]^{21}_D$ 9.94° in $(CHCl_2)_2$ (*c* 3.371). VII, m. 173-4° (decompn.) on rapid heating. VIII, $[\alpha]^{19}_D$ -60.14° (H_2O, *c* 2.112); tetraacetate, m. 83-4°, $[\alpha]^{21}_D$ -27.25° in $(CHCl_2)_2$ (*c* 5.412). From 5 g. VII allowed to attain mutarotation equil. in a slight excess of HCl and then acetylated were obtained 3 g. pure β-IV, m. 119-20°, $[\alpha]^{20}_D$ 10.9° in $(CHCl_2)_2$, and a small quantity of a highly purified α-IV, m. 126-7°, $[\alpha]^{20}_D$ 120.2° in $(CHCl_2)_2$ (*c* 0.416). **XIII. Addition of acetobromoglucose to thioureas: S-glucosido-*ps*-thioureas.** WILHELM SCHNEIDER AND KURT EISFELD. *Ibid* 1260-3.—Derivs. of an isomer (I) of Fischer's and Helferich and Kosche's thiourea glucoside (II) (*C. A.* **20**, 1595) are obtained when acetobromoglucose (III) is heated in a suitable solvent with $CS(NH_2)_2$. The III adds like a simple alkyl halide with primary formation of a thiuronium salt derived from a *ps*-thiourea with the acetylated sugar residue substituted on the S. PhNHCSNH$_2$ behaves in the same way but it has thus far not been possible to carry out the reaction with $CS(NHPh)_2$ and allylthiourea gives only amorphous, non-homogeneous products. Nor could the free glucothiosides be obtained from the Ac derivs. with NH_3 in MeOH, as they are decompd. by the NH_3-MeOH with formation of glucothiose. *Tetraacetyl-ps-thiourea S-d-glucoside-HBr* (*tetraacetyl-d-glucosido-S-thiuronium bromide*), $Ac_4C_6H_7O_5SC(NH_2)(:NH).HBr$ (37% from III in boiling PhMe slowly treated with powd. $CS(NH_2)_2$), m. 192°, $[\alpha]^{20}_D$ -8.72° (H_2O, *c* 5.102); 1 g. dissolves in 10 cc. H_2O and 7.5 cc. alc.; *bicarbonate*, $C_{16}H_{24}O_{12}N_2S$, from the bromide in cold H_2O with $NaHCO_3$, sinters 84°, m. 92° (foaming), soon weathers in the air but loses most of its CO_2 only *in vacuo* over absorbents, yields in H_2O at room temp. in 20-30 hrs. an amorphous product which from its compn. is apparently a decompn. product of the tetraacetylthioureaglucoside. *Primary oxalate*, m. 159° (decompn.). *Tetraacetyl[monophenyl-ps-thiourea]-S-d-gluco-*

side (50% from III refluxed in C_6H_6 with $PhNHCSNH_2$, extd. with aq. HCl and neutralized with $NaHCO_3$), m. 150°; 1 g. dissolves in 30–5 cc. boiling alc.; it is pronouncedly basic, dissolving in dil. HCl and being repptd. unchanged by $NaHCO_3$; in $(CHCl_2)_2$ it is optically inactive while in AcOEt (*c* 1.410), it shows $[\alpha]^{22}_D$ 19.15°. *Primary oxalate*, $[\alpha]^{20}_D$ —15.55° (50% alc., *c* 1.994). C. A. R.

Pectin substances. III. Chemical composition of pectins. Kazimierz Smoleński and Wanda Włostowska. *Roczniki Chem.* **7**, 591–611(1927); cf. *C. A.* **19**, 41; **20**, 2519; **21**, 3603—Sugar-beet pulp whose detailed analysis is given contains about 71% pectin substances. They were detd. with the aid of their "characteristic groups:" ash, pentosans, hexuronic acids, galactosides and galacturonic groups (as mucic acid), MeOH, acid and ester nos., volatile acids (AcOH), detd. by vacuum distn. with H_3PO_4 to dryness followed by vacuum-steam distn., org. acids (ash dissolved in excess acid and titrated with Me orange), protein (Kjeldahl). Galacturonides and arabans are extd. by the "usual" method which consists in heating 100 g. pulp 3 hrs. on the water bath to 95–7°, with 2 l. water and 62 cc. *N* HCl (the "theoretical" amt. of HCl obtained by titration with Congo red is 50 cc.), straining and neutralizing to Congo with Na_2CO_3. The soln. is evapd. to 20% solids and the *galacturonides* are pptd. by adding 400 cc. 90–5% alc. per 100 g. soln., and purified by dialysis against water. The filtrate contains araban, which is sepd. by vacuum evapn. The total ext. obtained is 42–3%. The O_2, H_2 and C contents of galacturonides obtained by this method from sugar beet, common beet and carrot are practically the same. The compn. of the arabans (arabinose, reducing sugars, $[\alpha]$) of the common and sugar beet resemble each other closely. A variation of acid concn., temp. and time will, however, cause a marked variation in quantity and compn. of the exts. As the hydrolysis becomes more energetic the content of arabans in reducing and *d*-rotatory sugars increases, while the galacturonides show an increasing content in arabans and "undetd. substance," which is galactan. The araban-free part of a galacturonide obtained by 3 hrs.' heating to 70–5° with 90% of the "theoretical" HCl pretty closely approaches the theoretical formula of a *Ca-Mg salt* of *Me acetyldigalacturonate*. The analyses confirm the formula originally attributed to *protopectin:* $(C_6H_8O_6.C_6H_7O_6.OMe)_n$ + $(C_6H_{10}O_5)_n$ + $(C_5H_8O_4.C_5H_8O_4.C_5H_8O_4)_n$. The galacturonide obtained by heating with distd. water to 90–5° has a similar compn. but contains only 0.5 the quantity of AcOH. The analysis sheds no light on the question whether galacturonide, araban and galactan are originally attached to each other. At any rate the bonds must be very weak. The araban bonds range next in instability, since water- and even alc.-sol. products are obtained already by heating with slightly acidulated water. Galactose is hydrolyzed by higher concns. and the products are insol. in 75% alc. Pure galacturonide becomes easily water-sol. but it is insol. in 75% alc., and is very resistant to further hydrolysis. The identity of the "undetd. substance" with galactan is borne out by the following facts: The ultimate products of galacturonide hydrolysis with HCl contain galactose, in quantities approximately corresponding to that of the undetd. substance. Galacturonide contains neither glucose nor glucuronic acid and the products of hydrolysis are free from fructose and mannose. The ester no. corresponds with the Me and AcOH content only in the case of the almost pure galacturonide. For the products of more energetic hydrolysis it is, for reasons unknown, considerably higher. **IV. Acid hydrolysis of galacturonide and araban.** *Ibid* 611–27—Galacturonide obtained by the "usual" method was subjected to fractional hydrolysis on the water bath: (*a*), 10 hrs. with 0.05 *N* H_2SO_4; (*b*), like (*a*); (*c*), 5 or 10 hrs. with 0.25 *N* H_2SO_4 or 5 hrs. with 0.5 *N* H_2SO_4. (*a*) splits off the MeOH, AcOH and some of the galactan and galacturonic acid, although in a more complex form. (*b*) splits more araban and galactan and liberates hexuronic acids. (*c*) completes the hydrolysis of the sugars and splits the remainder of araban, which seems to be more firmly attached and more resistant to hydrolysis to arabinose than the araban split by (*a*) and (*b*). It also yields a galacturonide, (I), sol. in 75% alc. contg. 90–5% *hexuronic acid* and perhaps some araban. Its mol. wt. (ebullioscopic) was 1115 and 912. $[\alpha]_D$ 216°. The analysis corresponds fairly well with $(C_6H_8O_6)_n$. The detn. of its characteristic groups suggests that it is the *mono-Ca digalacturonate*, $(C_{12}H_{16}O_{12}ca)_n$, where n = 3 or 4. It is easily sol. in hot and cold water, insol. in 70% alc. The aq. soln. is slightly acid to Congo, strongly to litmus. Mineral acid does not cause a ppt., NaOH produces a greenish color, $Ba(OH)_2$ and $Pb(OH)(AcO)$ give voluminous jelly-like yellowish green ppts. Of the *araban* the part contained in the galacturonic acid is not completely sepd. from it even by 10 hrs.' heating with 0.25 *N* H_2SO_4 and resists hydrolysis to arabinose by far more than the larger portion of araban, the hydrolysis of which begins already at 0.1–0.05 *N* H_2SO_4. The *l*-rotation decreases with increasing

reducing power until it reaches that of pure arabinose: 100° to 105°. From the partly hydrolyzed solns. the [α] of pure araban is calcd. to be —200° to —220°. From the [α] of I the [α] of pure, araban-free galacturonide is calcd. to be 250°. **V. Alkaline hydrolysis of galacturonide.** *Ibid* 628–36.—The addn. of 150 cc. *N* NaOH to 25 g. galacturonide obtained by the "usual" method in 250 cc. splits off MeOH and AcOH, leaving *Na pectate*, which contains as much galacturonic acid, araban and galactan as the original galacturonide. Part of the araban and galactan is split off by the addn. of moderately concd. HCl. Four hrs.' heating with *N* H_2SO_4 leads to a galactan-free substance with 90% galacturonic acid. This *polygalacturonic acid* $(C_6H_8O_6)_n$ differs from I in that it is very difficultly sol. in water and does not reduce Fehling's soln. $[\alpha]_D$ 250°. Heating with a large excess of MeOH contg. 0.7% HCl to 100° yields about 50% *Me ester*, which was not isolated. **VI. Products of complete hydrolysis of galacturonide and araban.** *Ibid* 636–55.—*d-Galacturonic acid*, $C_6H_{10}O_7.H_2O$, obtained by heating pectic acid 2.5 hrs. to 125–30° with 0.1 *N* H_2SO_4, pptg. the Ba salt from alc., decompg. with H_2SO_4 and crystg. from 70–80% alc., m. 110–2° (the m. p. rises to 158–9°, on continued rapid heating), [α] 49.9°. It shows mutarotation. The reducing power of the anhyd. acid is less than 80%, the quantity of mucic acid obtained by oxidation with HNO_3 about 85% of the values for galactose. The *galacturonide* proper contains 11.5% AcOH (1:2 mols.), and 7% MeOH, the "usual" product 5–5.5% AcOH and 5.5% MeOH. Both are easily sapond. by alkali, MeOH less easily by acid. There is also a trace of a volatile Ag-reducing acid, probably *glyoxylic acid*. *d-Galactose* is found among the products of acid hydrolysis of pectic acid and has been identified as its *o*-tolyl-, α-methylphenyl- and α-benzylphenylhydrazone. It was also obtained by fractional acid hydrolysis of the "usual" galacturonide and by energetic hydrolysis of galacturonide proper. In the latter case it was also identified by fermentation tests (*S. cerevisiae* and *S. pombe*). The acid hydrolysis of the (easily split) *a-araban* yields arabinose, identified by its crystals, [α] and hydrazones. It is also obtained by the hydrolysis of galacturonide, *i. e.*, from the resistant *b-araban*. **VII. Composition and constitution of pectin substances.** *Ibid* 655–77.—Beet pulp contains: *Arabangalactangalacturonide* (I), which is the polymeric *Ca Mg salt* of the *mono-Me arabangalactanacetyldigalacturonate*, $(C_{26}H_{38}O_{22})_n$ araban a, and as products of hydrolysis of I araban b, galactan and galacturonide proper. MARY JACOBSEN

Oxidation of carbohydrates, fats and nitrogenous products by air in presence of sunlight. C. C. PALIT AND N. R. DHAR. Allahabad Univ. *J. Phys. Chem.* **32,** 1263–8(1928).—Solns. of galactose, arabinose, cane sugar, glucose, levulose, lactose, maltose, starch, glycogen, urea, glycine, α-alanine, hippuric acid, Na urate, K stearate, K oleate, K palmitate and $K_2C_2O_4$ are oxidized when air is passed through them in presence of sunlight. The presence of a photosensitizer, such as ZnO, promotes oxidation. The bearing of these oxidations on the *use of sunlight in preventing deficiency diseases* is discussed. R. E. GIBSON

The reducing properties of methylated sugars. GEZA ZEMPLÉN. *Matematik. Természettudományi Ertesitö* **43,** 101–9 (Hung.), 110 (Ger.), (1926); cf. *C. A.* **20,** 1221.—The detn. of the structure of disaccharides according to the method of Irvine requires considerable quantities of material (20–30 g.). By a method based on the large differences which exist in the reducing properties of the various methylated disaccharides, the structure of the sugar can be detd. with a 0.1-g. sample. The practicability of this method was demonstrated with gentiobiose and cellobiose. J. S. REICHERT

Gentiobiose and its relation to amygdalin. GEZA ZEMPLÉN. *Matematik. Természettudományi Ertesitö* **42,** 292–8 (Hung.), 299 (Ger.) (1926); cf. *C. A.* **18,** 2891; **19,** 73, 276.—It is assumed that the synthesis of *amygdalin biose* is effected by means of amygdalin emulsin. The biose of amygdalin is identical with gentiobiose, since the *octamethylgentiobiose* gives the same products of hydrolysis as maltose. The complete synthesis of amygdalin was accomplished by converting dextrose by means of emulsin into gentiobiose, which was converted first into the octa-Ac compd. and then into *acetobromogentiobiose*. The latter with silver *l*-mandelate gives *heptaacetylgentiobiose mandelate* and *heptaacetylamygdalinic acid*. The lactone or the ester of this acid with NH_3 gives the amide, which with $POCl_3$ gives *heptaacetylamygdalin*. J. S. R.

New isocellotriose. H. OST. *Z. angew. Chem.* **41,** 696–8(1928).—The product of the acetylation of cotton cellulose by Ost and Prosiegel (*C. A.* **14,** 3656) contains in addn. to the cellotriose recently described (*C. A.* **21,** 3456) an *isocellotriose*, present in the portion freely sol. in alc. and [illegible]

crystn. (lost at 115–20°), forms no osazone, has no sweet taste, and is not fermented by yeast. It is only slowly hydrolyzed to dextrose by 2.5% HCl, conversion being incomplete after 8–10 hrs. and considerable amts. of humic substances formed. Acetylation with Ac_2O and $ZnCl_2$ affords an *undecaacetate*, m. 120–50°, $[\alpha]_D$ 2.4° ($CHCl_3$), which is somewhat more sol. than the similarly prepd. *undecaacetate* of the isomeric cellotriose, m. 200–20°, $[\alpha]_D$ 2.2 to 6.2°, the latter being contaminated with a little of the octaacetates, m. 222° and 192°, of the isomeric cellobiose. *Isocellobiose acetate*, m. 115–25° $[\alpha]_D$ 4° ($CHCl_3$), was similarly prepd. from isocellobiose, being much more readily sol. than the cellobiose octaacetate, m. 220°, which is also formed. B. C. A.

Benzylation and phenylation of 2-methylcyclohexanone. R. Cornubert and H. Le Bihan. *Compt. rend.* **186**, 1126–8(1928); cf. *C. A.* **22**, 1960, 3146.—When 2-methylcyclohexanone is treated with sodamide and benzyl halides under conditions calcd. to produce monobenzylation, there are produced benzyl-2-methylcyclohexanones, b_{17} 167–9° (chief product), 2,6-dibenzyl-2-methylcyclohexanone, m. 105° (also formed by hydrogenation of the benzylidene deriv. of 2-benzyl-2-methylcyclohexanone), and an isomeride of the last-named compd., b_{16} 230–2°. The mixt. of benzyl-2-methylcyclohexanones affords 6-benzylidene-2-benzyl-2-methylcyclohexanone, m. 80–1° (HCl additive compd., m. 124°), and the pyrone-like compd., m. 191°, already prepd. from 6-benzyl-2-methylcyclohexanone (C. and Borrel, *C. A.* **20**, 3456). From the latter results it is calcd. that the benzyl-2-methylcyclohexanones contain 9% and 10–11% of the 2,6-isomeride when prepd. by the use of $PhCH_2Br$ and $PhCH_2Cl$, resp. B. C. A.

A new iodosobenzene (iodoso-iodoxybenzene) electrode and its application for the determination of p_{OH} and p_H. Feliks Grossman. *Roczniki Chem.* **7**, 567–78 (1927).—The construction of the iodosobenzene electrode (I) is analogous to that of the quinhydrone electrode. Formulas for calcns. are evolved. I was compared with a H_2 (II) and a quinhydrone electrode (III) for a no. of fluids the p_H of which ranged from 1 to 13. For p_H 4.6, 6 and 7 the ratio of potentials I/II was 1.420, I/O_2 electrode (as calcd. from I/III) 0.190. The ratios gradually decrease on both sides of this range, until they reach the same values for p_H 1 and 13: 1.362 and 0.133, resp. The p_H obtained with the aid of I, II and the HgCl electrode agreed pretty well with each other for solns. ranging from 0.1 *N* HCl to 0.1 *N* NaOH. The potential of I is established in 5 min. and is fairly stable for acid solns. (for 0.1 *N* HCl it varied within a week from 1.060 to 1.064), less so for alk. solns. Mixts. of PhIO and $PhIO_2$ in the proportions of 1:1 to 1:10 gave practically the same results as I. A further increase of $PhIO_2$ resulted in a lower and less rapidly established potential. The potential of the *iodoxybenzene electrode* was considerably smaller and was established very slowly, so that consistent results were not obtained, possibly because of contamination with PhIO. The reaction underlying the potential of the electrode is: $PhIO + 2OH^- - 2(-) = PhIO_2 + H_2O$. It may be subdivided into 3 phases: $PhIO + H_2O = PhI(OH)_2$. $PhI(OH)_2 + 2OH^- - 2(-) \rightleftharpoons PhI(OH)_4$; $PhI(OH)_4 = PhIO_2 + 2H_2O$. The formulas were based on this equation assuming $[PhIO_2]/[PhIO] = 1$. But probably collateral reactions take place which are not accounted for in the formulas. Mary Jacobsen

Catalytic preparation of alkylanilines. I. Bankim Chandra Ray. Univ. College of Science, Calcutta. *J. Indian Chem. Soc.* **5**, 383–6(1928).—The prepn. of MeNHPh and Me_2NPh, with thoria as a catalyst, is studied. A mixt. of $PhNH_2$ (I) and MeOH (II), gave only 40% conversion when passed at 440° over thoria prepd. by burning the oxalate. Asbestos purified by digesting with HCl was soaked with $Th(NO_3)_4$ soln. and heated until decompn. of the nitrate was complete. Over this catalyst a mixt. of I and EtOH gave 67% conversion at 390°. A mixt. of I and II over this same catalyst at 430° gives 75% conversion. The quantity of unconverted I is detd. by diazotizing the product and then titrating with a known vol. of R salt. D. H. Powers

The action of light on diazo derivatives. A. Seyewetz and D. Mounier. *Bull. soc. chim.* **43**, 827–38(1928).—See *C. A.* **22**, 2373. E. H.

Optically active α-arsonocarboxylic acids. H. J. Backer and C. H. K. Mulder. *Proc. Acad. Sci. Amsterdam* **31**, 301–3(1928).—See *C. A.* **22**, 2364. E. H.

Reduction of aromatic nitro compounds in the presence of magnesium chloride. Stanislaw Micewicz. *Roczniki Chem.* **8**, 50–4(1928).—The following compds. were prepd.: *p*-toluidine, m. 44–5°, by 3 hrs.' heating on the water bath of 30 g. $MgCl_2.6H_2O$ (I) in 20 cc. water, with 10 g. *p*-$C_7H_7NO_2$ and 15 g. Fe (Ferrum reductum Merck). *o*- and *p*-aminophenol, m. 172° and 184°, by 0.5 hrs.' heating of 15 g. I, 20 cc. water, 5 g. nitrophenol and 15 g. Fe. Yield 80%. *m*-$C_6H_4(NH_2)_2$ by refluxing 5 hrs. 10 g. $C_6H_4(NO_2)_2$ in 75 cc. acetone with 75 g. I in 75 cc. water and 30 g. Fe. Yield 70%. *p*-$C_6H_4(NH_2)_2$, m. 138–9°, by refluxing 4–5 hrs. 10 g. nitroaniline in 75 cc. acetone with 75 g. I in 75 cc. water and isolating as the HCl salt. The grass-green intermediate

formed in the beginning soon disappears The *o*- and *m*-compds. can be reduced in the same manner. 1,2,4-Dinitrotoluene resisted reduction. The ease of reduction decreases in the following order: nitrophenols, nitroanilines, nitrobenzenes. Attempts at the isolation of jelly-like, sometimes colored intermediates which are probably compds. of the amine and $MgCl_2$ were unsuccessful. MARY JACOBSEN

Presence of *o*-arsanilic acid in technical arsanilic acid. N. P. POZDNYAKOV. *J. Chem. Ind.* (*Moscow*) **5,** 530(1928).- It is known that *p*-arsanilic acid which is prepd. by the action of H_3AsO_4 on $PhNH_2$ contains Ph_2AsO_2H as an impurity (cf. Benda, *C. A.* **2,** 2938; Kober and Davis, *C. A.* **13,** 1858). P. found that it also contains *o*-arsanilic acid in fairly large quantity. The presence of the latter impurity is particularly undesirable, since arsphenamine obtained from arsanilic acid contg. it would contain some *o*-arsphenamine, the properties of which are not well known. To sep. *o*- from *p*-arsanilic acid P. recommends a method which is founded on the greater soly. in water of the former 100 g. of water dissolves at 16.5° 2.801-2.875 g. of *o*-arsanilic acid, whereas the same quantity of water dissolves at 15.5° only 0.390 g. of *p*-arsanilic acid. 100 g. of triturated technical 84% arsanilic acid is agitated in a mixing app. with 900 cc. water at 15-17° for 6 hrs., after which the undissolved residue of *p*-arsanilic acid is filtered and the filtrate is concd. to 100 cc. by evapn. on a steam bath Crystals of *p*-arsanilic acid ppt. on cooling and are filtered off, while the filtrate is concd. to 40-50 cc. to ppt *o*-arsanilic acid. BERNARD NELSON

Organo-antimony compounds. II. The constitution of *p*-aminostibonic acid and its amine salts. SUDHIR CHANDRA NIYOGY. Univ. College of Science, Calcutta. *J. Indian Chem. Soc* **5,** 285-91(1928); cf *C. A.* **22,** 1148.—A study is made of the constitution of the salts of the arylstibonic acids. *p*-$AcNHC_6H_4NH_2$ diazotized at 0° in HCl was treated with aq $SbCl_3$ to give a white insol product. Drying this product over soda lime 2 days, and warming with NaOH until N_2 evolution ceased gave 4-aminophenylstibonic acid (I), which must be preserved in aq. suspension. I with aq. $MeNH_2$ gave, after warming 5 min., $(NH_2C_6H_4SbO_3H_2)_3MeNH_2$. The following *salts* were also prepd and in every case had 3 mol of the stibonic acid to one of the base, thus confirming Schmidt's contention: Me_2NH, Me_3N, $EtNH_2$, Et_2NH, Et_3N, $PrNH_2$, *iso*-$AmNH_2$, and $AmNH_2$. D. H. POWERS

A new method of preparing organo-mercury compounds of phenols, phenol ethers and aromatic amines. P. NEOGI AND MANAS P. CHATTERJI. Presidency College, Calcutta. *J. Indian Chem Soc* **5,** 221-9(1928). It was shown by Neogi (*C. A.* **21,** 1398) that glycerol (I) greatly increases the period of induction in the interaction of $HgCl_2$ (II) and $NaHCO_3$ (III) Aromatic phenols or amines are added to this mixt during the period of induction and offer a new method for forming Hg compds. To PhOH (10 g.) in H_2O with I (10 cc.) is added an aq. soln. of II (6 g.). On addn. of a soln. of III a yellowish ppt. seps., which changes to white when dil. HCl or strong NaCl is added. It is found to be a mixt of *p*-HOC_6H_4HgCl, m. 219°, and the *o-isomer* m. 133°. Similarly catechol (4 g.) with I (10 cc.), II (16 g.) and III (5 g.) gives *o*-$C_6H_4(OHgCl)_2$, decomps. 150° Resorcinol (5 g.) with 15 cc. of I, 20 g. of II and 6 g. of III gives *m*-$C_6H_4(OHgCl)_2$, decomps 210°. Orcinol similarly gives 1,3,5-$MeC_6H_3(OHgCl)_2$, decomps. 210°. Guaiacol (3 g.) in alc. with 20 cc. of I is mixed with an aq. soln. of III (2 g.) and an aq. soln of II (6 g.) is slowly added to give *o*-$MeOC_6H_4OHgCl$, decomps. 130°. Phloroglucinol gives 1,3,5-$C_6H_3(OHgCl)_3$, decomps. 160°. Quinol gives *p*-$C_6H_4(OHgCl)_2$, decomps. 160°, but this product is not pure because oxidation caused the formation of quinone and consequently HgCl and Hg, and the product could not be purified because of its insoly With amines I is not necessary. To $PhNH_2$ (3 g.) in alc. with 3 g. of III in H_2O is added a hot aq soln. of II (9 g.) to yield the insol. yellow PhNHHgCl. PhNHMe gives PhNMeHgCl, decomps. 108°. $PhNMe_2$ in alc. was mixed with aq. III, and alc II was added and the mixt. allowed to stand 2 hrs. to give *p*-mercurodiphenylenetetramethylmercurodiammonium chloride. D. H. POWERS

Preparation of dimethylaminodiaryl sulfones. ERICH GEBAUER-FÜLNEGG AND PAUL SCHWARZ. Univ. Wien. *Ber.* **61B,** 1307-8(1928).—Like Bergel and Döring (*C. A.* **22,** 2555), G.-F. and S. have found that the compds. described by Michler as sulfones are really sulfonic acid methylanilides and they have devised a simpler and more generally applicable method than B. and D.'s for the prepn. of the true dimethylaminodiaryl sulfones. Arylmono- and polysulfonyl chlorides are made to react in the presence of $AlCl_3$ as in the condensation of sulfonyl chlorides with aromatic ketones, the simultaneous formation of Me violet being prevented as far as possible by controlling the temp. exactly, which can advantageously be done by using an appropriate solvent. *E. g.*, *4'-dimethylamino-4-methyldiphenyl sulfone*, m. 212°, and *4-dimethylaminodiphenyl sulfone*, m. 178°, were obtained by boiling 10 g. *p*-$MeC_6H_4SO_2Cl$ ($PhSO_2Cl$), 2 mols.

$PhNMe_2$ and 1 mol. $AlCl_3$ in CS_2 for about 2 hrs. A report on dimethylaminophenyl sulfones of the $C_{10}H_8$, $C_{10}H_7OH$ and $C_6H_4(CO)_2C_6H_4$ series, their use as dyestuff components and deviations in the course of the reaction will be made elsewhere.

C. A. R.

Bromoiodophenols produced from 5-bromo- and 3,5-dibromosalicylic acids. P. Brenans and C. Girod. *Compt. rend.* **186**, 1128–30(1928).—I reacts with 5-bromosalicylic acid (Hewitt, Kenner and Silk, *J. Chem. Soc.* **85**, 1228(1904); also produced from 5-aminosalicylic acid by the diazo reaction) in the presence of NaOH or Na_2CO_3 to afford 4,2,6-$BrI_2C_6H_2OH$, m. 128° (Et ether, m. 75°), which when heated with aq. Na_2CO_3, is converted into an amorphous red compd. of unknown constitution. 3,5-Dibromosalicylic acid, when treated with less than 1 mol. of I under similar conditions, yields 2,4,-6-$Br_2IC_6H_2OH$, m. 104° (Et ether, m. 54°), which is transformed into a red compd. when treated with an excess of I in aq. Na_2CO_3. B. C. A.

Chloroiodophenols obtained from 5-chloro- and 3,5-dichlorosalicylic acids. P. Brenans and C. Girod *Compt. rend.* **186**, 1553–5(1928).—I in the presence of NaOH reacts with 5-chlorosalicylic acid to afford 4,2,6-$ClI_2C_6H_2OH$, m. 108° (*Et ether*, m. 69°; *Ac deriv.*, m. 127.5°). In a similar way 3,5-dichlorosalicylic acid yields 2,4,6-$Cl_2IC_6H_2OH$, m 63° (*Et ether*, b. 290 4°; *Ac deriv.*, m. 66°). B. C. A.

Constitution of some dinitro-*m*-cresols. Shrirang M. Sane and Shiam Sundar Joshi. Lucknow Univ. *J. Indian Chem. Soc.* **5**, 299–301(1928).—A study is made to det. the constitution of some dinitro-*m*-cresols. *m*-MeC_6H_4Cl with H_2SO_4 and HNO_3 gives 3,4,6-$Cl(O_2N)_2C_6H_2Me$, m. 91°, which on fusion with $AcNH_2$ and NaOAc at 180° for an hr. gives the 3-HO compd. (I), m. 71°. I with *p*-$MeC_6H_4SO_2Cl$ (II) and with Et_2NPh (III), at 100° for 4 hrs. gives 4,6-dinitro-*m*-tolyl *p*-toluenesulfonate (IV), m. 110 1°. IV in xylene satd with dry NH_3 for one hr. gives 3,4,6-$H_2N(O_2N)_2C_6H_2Me$, m. 194°. I in HOAc with Br_2 gives 2,3,4,6-$Br(HO)(O_2N)_2C_6HMe$ (V), m. 115 6°. V with II and III at 100° for 6 hrs. gives 3,2,4,6-$ClBr(O_2N)_2C_6HMe$, m. 81–2°

D. H. Powers

Condensation of pyruvic acid with aromatic aldehydes and amines. II. St. Weil and Fr. Goldberg. *Roczniki Chem.* 7, 585–90(1927).—See *C. A.* **22**, 2152. M. J.

Mechanism of the reaction between pyrocatechol and phosphorus trichloride. Ludwig Anschütz and Walter Broeker. Univ. Marburg. *Ber.* **61B**, 1264–7(1928); cf. *C. A.* **21**, 2461.—Knauer (*Ber.* **27**, 2569(1894)) had found that *o*-$C_6H_4(OH)_2$ (I) and PCl_3 give $C_6H_4O_2PCl$ (II) and $(C_6H_4:)_3(PO_3)_2$ (III) and A. and B. have now succeeded in isolating an intermediate product, *o-phenylene o-hydroxyphenyl phosphite*, $C_6H_4O_2POC_6H_4OH$ (IV). The process therefore probably consists of 3 successive bimol. reactions: I + PCl_3 = II + 2HCl; II + I = IV + HCl; IV + II = III + HCl. K.'s method of prepn. of II gives only very poor yields; treatment of III with PCl_3 at 160° is much more satisfactory. **II**, like other ester chlorides of sym H_3PO_3, can add S at high temps.: II + S (at 195°) → $C_6H_4O_2PSCl$ (V). **IV** (5–7 g. from 22 g. I refluxed with PCl_3 in C_6H_6, protected from the air), b_{12} 155°, m. 112–3° very sensitive to atm. moisture, evolves HCl with AcCl, the resulting product decompg on distn. *in vacuo*; with II at 120°, it yields **III**. **II**, m. 30°, b_{10} 80°. *Pyrocatechylphosphorus thiochloride* (V), m. 49–50°, b_1 106°, mol. wt. (Rast) 208. C. A. R.

Synthesis in the propenylphenol series. L. V. Douau. *Parfumerie moderne* **7**, 320–3(1927); **8**, 18–21, 210–4(1928).—A review. A. Papineau-Couture

The ethylenic isomerism of the β-*p*-tolylbenzalacetophenones. Marius Badoche. Coll. de France, Paris. *Bull. soc. chim.* **43**, 337–43(1928).—Usually prepn. of a compd. with an ethylene bond does not give the 2 isomers. Dufraisse states that the constitution of the compd. rather than the method of prepn. dets. whether both stereoisomers will be formed. In the prepn. of *β-p-tolylbenzalacetophenone, p-MeC₆H₄CPh:CHCOPh* (I), both isomers are formed. Probably the presence of both isomers is not due to transmutation, for transmutation gives mixts. less rich in the labile isomer than does prepn. The methods of prepn of I were the isomerization of *p*-$MeC_6H_4CPh(OH)C:CPh$ (II) and the removal of HBr from *p-tolylphenyl-α-bromopropiophenone, p-MeC₆H₄CHPhCHBrCOPh* (III). Into cold EtMgBr (4 g. Mg + 19 g. EtBr) is poured 17 g. HC : CH in 17 cc. Et_2O; the mixt is heated later on the H_2O bath, then cooled and treated gradually with 31.5 g. *p*-MeC_6H_4COPh in 35 cc. Et_2O then boiled 1 hr. This gives 46.7 g. of **II** b_{6-7} 205°. **II** (47 g.) in 360 cc. 96% EtOH with 40 cc. H_2SO_4 (66° Bé), heated 1 hr., gives upon cooling a product (I) which is washed with $NaHCO_3$, H_2O and EtOH; yield 36 g., m. 63–110°, and 3.3 g. additional from the mother liquor; I is a mixt. of 2 stereoisomers, *A*, lozenges, sometimes large rhombohedric crystals and *B* fine needles, often grouped in tufts. Crude I, dissolved in EtOH with the aid of heat and allowed to crystallize for 48 hrs. in the refrigerator, gives *A* as huge crystals

and *B* as fine needles which are dissolved out of the cryst. residue by warm EtOH. More *A* is obtained similarly from the mother liquors. *A*, recrystd. from EtOH, m. 109.5–10.5°. *B* is extd. from the residues after the removal of *A* by the method of Dufraisse (*C. A.* **16**, 2327); *B* m. 85–6°, but changes spontaneously and melts much lower after several days. *B*, suspended in EtOH and exposed to sunlight, becomes almost wholly *A;* upon boiling *B* in alc. with HCl (but not with HOAc) the result is the same. *A*, heated at 120–30° for 10 min in a sealed tube with a particle of I, changes into *B* to the extent of 10%. From p-MeC_6H_4MgBr (6.7 g. Mg + 48.5 g. p-MeC_6H_4Br) and 40 g. PhCH:CBrCOPh in 50 cc. ether, added drop by drop, is obtained 48 g. of III; purified with an alc. ether mixt., III m. 134–5°. III (8 g.) and 10 g. quinoline heated 0.25 hr. at 185–90°, give 6 g. of a mixt. of *A* and *B*. III and pyridine, heated 3 hrs. at 130–40°, lost 37% of its Br and gave a poorer yield of *A* and *B* than in the above case. MARGARET W. MCPHERSON

Saccharin. HUBERT VAN ROOST. *Bull. trimestr. assocn. élèves école sup. brasserie univ. Louvain* **28**, 49–61(1928).—A review. A. PAPINEAU-COUTURE

Action of organic magnesium compounds on cinnamic acid anilides. N. MAXIM AND N. IOANID. Univ Bucarest. *Bull soc. chim. Roumania* **10**, 29–48(1928).—RMgBr on PhCH:CHCONEt$_2$ gives $PhCHRCH_2CONEt_2$ (I) instead of a ketone as is the case with satd. aromatic amides. By hydrolysis with HBr I gives PhCHR-CH_2CO_2H (*C. A.* **22**, 2153). EtMgBr and PhMgBr react quant. with *N*-substituted cinnamic acid anilides to give satd. *N*-substituted acids. The ethyl-, methyl- and phenylanilides have been prepd. by the action of PhCH:CHCOCl on the corresponding amines. PhCH:CHCONMePh (II), b_{15} 231°, m. 70°, and EtMgBr (III) give β-phenylvaleric methylanilide, b_{12} 206°. PhMgBr (IV) on II gives β,β-diphenylpropionic methylanilide, b_{13} 261°. With III, the ethylanilide, b_{16} 234°, m. 46°, gives β-phenylvaleric ethylanilide, b_{16} 214°; with IV it gives β,β-diphenylpropionic ethylanilide, b_{25} 278°. The phenylanilide, m. 156°, with III gives β-phenylvaleric phenylanilide, b_{18} 268°, m. 52–3°; with IV it gives β,β-diphenylpropionic phenylanilide, m. 130°. MeMgI (V) reacts weakly with cinnamic acid anilides and gives exclusively the corresponding ketone and amine. PhCH·CHCONRPh (VI) and MeMgI give PhCH:-CHCOMe and HNRPh. These satd. anilides hydrolyze easily with 40% HBr to give the corresponding satd. acids. The reaction of III and IV on the anilides is still unexplained. The reaction with V is as follows: V and VI form PhCH:CH(CMeOMgI)-NRPh, this with water gives PhCH:CHC(OH)MeNRPh, then PhCH:CHCOMe and HNRPh. This is in contradiction with Thiele's theory of partial valences. M. and I. conclude V reacts contrary to Thiele's theory. The reaction between III, IV and the cinnamic acid anilides is not known. 3- and 4-addn are theorically possible; expts. only can settle which takes place. By the action of III and IV on cinnamic acid anilides, satd. anilides are obtained quant.; these hydrolyze to give satd. acids. V reacts on cinnamic acid anilides to give a small quantity of benzylideneacetone. This cannot be considered a practical method because of the low yields. Detailed exptl. data are given for the prepn. of the products mentioned. By hydrolysis with HBr, β-phenylvaleric methyl- and ethylanilides give $EtCHPhCH_2CO_2H$, m. 66°; β,β-diphenylpropionic methyl- and ethylanilides give $Ph_2CHCH_2CO_2H$, m. 155°; $EtCHPhCH_2CONPh_2$ gives a mixt. of $EtCHPhCH_2CO_2H$ and $NHPh_2$; $Ph_2CHCH_2CONPh_2$, a mixt. of $Ph_2CHCH_2CO_2H$ and $NHPh_2$. P. THOMASSET

Photobromination of *m*-nitrobenzylidenemalonic ester. II. JNANENDRA C. GHOSH, KALI P. BASU AND SUDHIR C. BHATTACHARYYA. Dacca Univ. *J. Indian Chem. Soc.* **5**, 183–90(1928); cf. *C. A.* **22**, 1151.—The photobromination of m-O_2N-C_6H_4CH:$C(CO_2Et)_2$ in CCl_4 is studied under the same conditions as outlined previously in the study in CS_2 soln. There was practically no reaction for 24 hrs. in the dark. The equil. which is given by [dibromide]/[Br] × [ester] is detd. by the temp. and intensity of radiation. It is noted that the ratio of the equil. consts. (1.55) is equal to the ratio of the square roots of the corresponding incident intensities (1.45). Varying the intensity of radiation and temp. gives 1.8 and 2.1 for the temp. coeff. of k_1 and the equil. const. K_2 at 32° is 78.0. It is shown that the equil. const. is dependent on the intensity of the illumination and in the initial stages of the reaction the velocity of photobromination is proportional to the concn. of Br_2 and increases with decreasing concn. of ester. The equil. const. in CCl_4 is 7 times its value in CS_2 and the velocity of bromination is about 7 times its rate in CS_2 and the decompn. of the dibromide proceeds further and more quickly in CS_2. D. H. POWERS

Amides of thio- and dithiosalicylic acid. ARNOLD REISSERT AND ERICH MANNS. Univ. Marburg. *Ber.* **61B**, 1308–16(1928).—o-$HOC_6H_4CONH_2$ by the Schotten-Bauman method gives not only the *N*-Bz deriv. $HOC_6H_4CONHBz$ (I), m. 208°, but

also a di-Bz deriv. (in C_5H_5N even a tri-Bz deriv. is formed), whereas in the presence of Na_2CO_3 instead of NaOH is obtained the *O*-Bz isomer, $BzOC_6H_4CONH_2$ (**II**), m. 144°, which at first does not dissolve in NaOH but on standing does dissolve with yellow color and rearranges into **I**, which explains why it is not obtained by the S.-B. method. It was of interest to det. how *o*-$HSC_6H_4CONH_2$ (**III**) would behave on benzoylation. It is probable that the action of alkalies on aromatic disulfides can be represented by the equation PhSSPh + 2KOH = PhSK + PhSOK + H_2O, the PhSOK then oxidizing to $PhSO_2K$. Accordingly, (*o*-$H_2NCOC_6H_4S)_2$ (**IV**) with NaOH should give $H_2NCOC_6H_4SNa$ and $H_2NCOC_6H_4SONa$ (**V**) and such is the case, but the **V** at once forms *α,β-benzisothiazolone* (**VI**), $C_6H_4.CO.NH.S$; along with it are obtained the mercaptan and disulfide, the latter formed from the former by spontaneous oxidation or by the oxidizing action of the non-anhydrized **V**. The **VI** can be obtained without by-products by adding Br to **IV** and then removing HBr (best with boiling AcOH) from the resulting $H_2NCOC_6H_4SBr$. The *N*-Me and *N*-Ph derivs. of **VI** were similarly obtained from the *methylamide* and anilide of $(HO_2CC_6H_4S)_2$. H_2O_2 oxidizes the $C_6H_4.CO.NR.S$ to the corresponding saccharins, $C_6H_4.CO.NR.SO_2$. The Ag salt of **VI** with MeI gives the *N*- and *O-Me* derivs. On benzoylation **IV** reacts as would be expected from its behavior with alkalies; by the Schotten-Baumann method it gives the Bz deriv. of **VI**, also obtained from the Na salt of **VI** with BzCl, and a Bz deriv. (**VIII**) of **III** which, by analogy with $H_2NCOC_6H_4OH$, should be the *N-Bz deriv* formed by rearrangement of the *S*-deriv. (**VIII**). **VII** could not be isolated as such but its presence was shown by its oxidation with air to $(BzNHCOC_6H_4S)_2$. **VIII** is obtained by boiling with BzCl in C_6H_6 suspension the dry Na salt of **III**, prepd. from **IV** with Zn dust. When the benzoylation of **IV** by the S.-B. method is carried out with an excess of BzCl and NaOH, there are formed, together with the Bz deriv. of **VI**, the *di-* and *tri-Bz derivs.*, $BzNHCOC_6H_4SBz$ (**IX**) and $Bz_2NCOC_6H_4SBz$ (**X**), of **III**. **IX** is also obtained by boiling **X** with AcOH. *o*-$PhNHCOC_6H_4SH$ (**XI**) with NaOH and excess of BzCl gives a mixt. of the *S-Bz* (**XII**) and *di-Bz* (**XIII**) *derivs.* **XII** is also obtained by boiling the dry Na salt of **XI** with BzCl in C_6H_6 and is not oxidized to a disulfide by the air. With alkalies (*o*-$PhNHCOC_6H_4S)_2$ (**XIV**) gave **XI**, as expected, but the Ph deriv. of **VI** could not be obtained in large enough quantity for purification by this method. (*o*-$MeNHCOC_6H_4S)_2$, from the chloride and $MeNH_2$ in boiling C_6H_6, m. 216.5°. **VI** (1.6 g. from 2 g. **IV** treated with Br in CCl_4 and subsequently boiled with AcOH), m. 157–8°, sol. in alkalies and repptd. unchanged, even after boiling, by acids. *N-Ph deriv.* (3.6 g. from 4 g. **XIV** with Br and then boiling AcOH), m. 143–4°. *N-Me deriv.*, m. 54°; *HBr salt*, m. 216° (decompn.); *HCl salt*, m. 130° (decompn.). *O-Me ether* (*3-methoxy-α,β-benzisothiazole*), liquid volatile with steam. *N-Bz deriv.*, m. 167°. **XII**, m. 135°. *N,N'-Dibenzoyldithiosalicylic diamide*, m. 191°. **IX**, m. 135°, mol. wt. (Rast) 365.3. **X**, m. 220–2°, **XII**, m. 140°, **XIII**, m. 614°. C. A. R.

Constitution of fraxetin. F. Wessely and E. Demmer. Univ. Wien. *Ber.* **61B**, 1279–84(1928).—Fraxetin (**I**) had been shown to be a methoxydihydroxycoumarin but the position of the substituents was not known. Prepd. by hydrolysis of fraxin with dil. H_2SO_4 or HCl on the H_2O bath, it turns yellow 150° and m. 227–8°. With CH_2N_2 it gives almost quant. the di-Me ether, m. 103–4°, $b_{0.2}$ 90–100°, prepd. by Korner and Biginelli with MeI. Heated with 2 atoms Na in abs. MeOH at 100°, then with 3 mols. MeI, this ether yields a $(MeO)_4C_6HCH:CHCO_2Me$, hydrolyzed by 2 mols. boiling *N* NaOH to the free acid which, neutralized with *N* NaOH and oxidized with a quantity of $KMnO_4$ equiv. to the NaOH used, yields *2,3,4,5-tetramethoxybenzoic acid* (**II**), m. 87.5°, identical with the product obtained from 2,5,3,4-$(MeO)_2(HO)_2C_6HCO_2H$ (**III**) and CH_2N_2. *Diethylfraxetin*, from **I** and $MeCHN_2$, m. 81–2°, treated with Na in MeOH and then with MeI as above gives a *Me dimethoxydiethoxycinnamate*, m. 62–74°; the free acid on oxidation gives *2,5-dimethoxy-3,4-dihydroxybenzoic acid*, m. 83°, identical with the product obtained from **III** with $MeCHN_2$. The **III**, m. 146–7°, is obtained in 50% yield from apiolic acid, 2,5,3,4-$(MeO)_2(CH_2O_2)C_6HCO_2H$, heated on the H_2O bath with 2 mols. *m*-$C_6H_4(OH)_2$ and concd. H_2SO_4. **I** must, from the above results, have the structure MeOC═CH—C.CH:CH.

HOC:C(OH).C.O—CO. C. A. R.

Remarks on the communication of I. L. Kondakov on the addition of chlorine and bromine to pinene. Ossian Aschan. *Ber.* **61B**, 1342–3(1928).—Reply to K. (*C. A.* 22, 1969). C. A. R.

Some new aspects of the chemistry of isopulegol. R. Naves. Établissements

A. Chiris, Grasse. *Parfums de France* **6**, 191–204(1928).—(In French and English.) A review with bibliography of 49 references. A. PAPINEAU-COUTURE

The application of the Hoesch reaction to nitrobenzonitriles. MASATARO YAMASHITA. Tohoku Imp. Univ., Sendai. *Bull. Chem. Soc. Japan* **3**, 180–2(1928).—To 3 g. *p*-$O_2NC_6H_4CN$ (I) and 2.5 g. resorcinol (II) in 150 cc. abs. Et_2O, 2 g. freshly fused and powd. $ZnCl_2$ was added, and dry HCl passed into the soln. for 5 hrs. at room temp A brownish red oil sepd. The soln. was allowed to stand overnight, the Et_2O decanted, the oil washed with Et_2O and boiled with 50 cc. H_2O for 30 min. There was thus obtained 0.9 g. of 4′-nitro-2,4-dihydroxybenzophenone (III), pale yellow, m. 203° (200° given by Korczynski and Nowakowski *Bull. soc. chim.* **43**, 329). Other substances prepd. by the same method were *3′-nitro-2,4-dihydroxybenzophenone* (IV), from *m*-$O_2NC_6H_4CN$ (V) and II, yellow, m. 228°; 4′-nitro-2,4,6-trihydroxybenzophenone, from I and phloroglucinol (VI), yellow, m. 246–7° (244–5° given by K. and N.); *3′-nitro-2,4,6-trihydroxybenzophenone*, from V and VI, yellow, m. 194°. The *Me deriv.* of III, prepd. by shaking III in 10% NaOH with Me_2SO_4, was pale yellow and m. 123–4°; *Me deriv.* of IV, m. 116–7°. *o*-$O_2NC_6H_4CN$ could not be condensed with either II or VI. Y. plans to use the compds. obtained by means of this reaction for the prepn. of derivs. of Ph_2CO contg. various substituents in the benzene nucleus. LOUISE KELLEY

Colored hydrocarbons of the rubrene family. ANTOINE WILLEMART. *Compt. rend.* **187**, 385–7(1928); cf *C. A.* **22**, 3889.—In the transformation of R′R″C(OH)C:CR‴ (I) into a rubrene hydrocarbon through the HCl ester, the nature of the R′, R″ and R‴ groups exercises a very important influence on the reaction. The results have been negative with aliphatic groups, and favorable with tolyl or $C_{10}H_7$ groups only when such groups were in the R‴ position The mechanism suggested by W. for the reaction is as follows: After the formation of R′R″CClC:CR‴ from I, the Cl migrates, giving an intermediate allene compd., R′R″C·C:CClR‴, not yet isolated. This undergoes cyclization, forming an unstable cyclic allene deriv., which is at once transformed with rearrangement of the bonds, into a dimer. This theory explains the difficulty of obtaining the hydrocarbon sought when R′ and R″ are different. The reaction product contains instead of 1 substance, the 2 isomeric hydrocarbons formed from the cyclization by R′ or by R″, and their extn. is almost impossible. When R′ and R″ are $C_{10}H_7$ groups, the skeleton of the mol. is markedly changed, and it is not surprising that the reaction follows a very different course. A $C_{10}H_7$ group in the R‴ position modifies the skeleton least, and it is therefore possible in this case to obtain the corresponding rubrene. The formula proposed by W. is also in accord with the strong coloration of these hydrocarbons and their unusual properties. L. K.

Action of bromine on azomethine derivatives of fluorene. ARMANDO NOVELLI. *Anales asoc. quím. Argentina* **15**, 423–9(1927).—Graebe (*Rev. chim. pura applicada* 1889) studied the action of Br on dibenzofulvenes, finding that diphenylenedibenzofulvene (bisdiphenyleneëthene) fixes 2 Br atoms to form a colorless Br_2 deriv., $(C_6H_4.C_6H_4.CBr)_2$. Thiele and Henle (*Ann.* **347**, 290(1906)) obtained the corresponding Br_2 deriv. of phenyldibenzofulvene. It is interesting to det. if in the dibenzofulvene imides Br acts similarly to form a colorless Br_2 deriv. with azomethines (*C. A.* **22**, 775). The action of Br on Schiff bases is very similar to that with azomethines studied by Hantzsch (*Ber.* **23**, 2774(1890)), who tried Br on PhCH:NPh, obtaining PhCHBrNBrPh, which H_2O decomps. very readily to BzH and *p*-$BrC_6H_4NH_2$. This suggests fixing Br not directly on the double bonds but in the *p*-position to form *p*-BrC_6H_4CH:NPh.HBr. The Br atoms are very labile and the derivs. obtained are sol. in anhyd. solvents. If the solvent contains H_2O the compd. is decolorized at once by decompn. The anhyd. soln. attacks Cu or Au to form bromides, but if the solvent contains H_2O these metals are not attacked. Decompn. thus occurs in contact with H_2O with migration of the Br atoms. Berg (*C. A.* **19**, 2645) studied under similar conditions the addn. products of Br on Schiff bases differing as to the aldehydes and amine bases used in their prepn. He found the Br addn. products to be cryst. yellow powders or orange liquids insol. in C_6H_6, CS_2 or ether, generally very sensitive to light. When the amine is aromatic 1 Br atom is found on the amine nucleus; the other forms HBr on decompn., regenerating the aldehyde. The azomethines studied by N., derivs. of 2,7-dibromofluorene condensed with *p*-$ONC_6H_4NMe_2$ (cf. *C. A* **22**, 775), when in contact with Br give addn. compds. of the general formula: $C_6H_3Br.C_6H_3Br.CBrNBrC_6H_4NMe_2$. 1.78 g. of the azomethine in ice-cold CS_2, is slowly treated with the theoretical quantity of Br (0.005 mol.) in

CS_2, giving a violet ppt. and a red liquid, allowed to stand 12 hrs., filtered, washed with boiling CS_2, giving a yellow powder decompg. readily with H_2O to form 2,7-dibromofluorenone, m. 210°. Tests with metallic Ag or Au show that before hydrolysis the 2 Br atoms are attached to the $>C:N.C:N$ group, since if they were on the C_6H_6 nucleus they would have insufficient lability to combine with the metal. E. M. S.

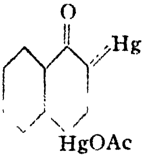
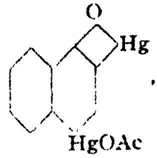
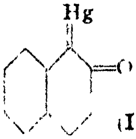
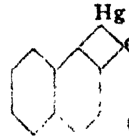
Diaminotriphenylmethane and the like (preliminary communication). HUGO WEIL, EUGEN SAPPER, E. KRÄMER, KARL KLÖTER AND HANS SELBERG. Lab. Dr. H. Weil, München. *Ber.* **61B**, 1294–1307(1928).—All the methods of prepg. $(H_2NC_6H_4)_2$-CHPh (I) hitherto described give poor yields. In all of them the quantity of $PhNH_2$.-HCl used is far too large, resulting in a phenylation of the I formed primarily. When the quantity of $PhNH_2$.HCl is materially reduced not only are excellent yields obtained but after heating only about 45 min. at 130–40° the $PhNH_2$ addn. product (II) seps. on cooling in large crystals. According to Werner Ph_3CH also seps. from $PhNH_2$ with 1 mol. of the solvent but the present authors have found repeatedly that when the crystals are washed with alc. to disappearance of the $PhNH_2$ odor, the resulting Ph_3CH, m. 92°, is entirely free of $PhNH_2$. II, m 126°, is quite stable and can be recrystd. unchanged from alc.; steam removes the $PhNH_2$ only very slowly and incompletely and only after addn. of NaOH can all the $PhNH_2$ be driven off, the remaining I m. 139° after crystn. from Et_2O. Pure I can also be obtained without the use of org. solvents by converting the crude base into the sulfate, which is difficultly sol in H_2O as well as alc., and decompg. the salt with NH_4OH On recrystn. from C_6H_6, the $PhNH_2$ is replaced by C_6H_6 and the C_6H_6 addn. product (III) seps. and, conversely, III changes into II on recrystn. from $PhNH_2$. The same change is effected, although not so completely, by long standing in the cold, the I sepg. with 1 mol. of that of the 2 substances ($PhNH_2$ or C_6H_6) which is present in larger quantity. If I, II and III, resp., are treated in cold AcOH with Ac_2O, I gives the di-Ac deriv. (IV), m. 240–1°, quant. in 4 hrs.; III at the end of this time only begins to deposit crystals which rapidly increase in quantity to about $^2/_3$ the calcd. on rubbing, the yield becoming nearly quant. after a short time; II, generally, gives not a trace of crystals in 4 hrs. even when the soln. is seeded, and the sepn. of IV is approx. complete only after about 24 hrs. This is not due merely to a difference in soly. IV dissolves no more readily in AcOH-Ac_2O contg. corresponding quantities of $PhNH_2$ or PhNHAc than in the AcOH-Ac_2O alone. These reactions have been repeated hundreds of times, always with the same results, whether the acetylation had been effected in AcOH or abs. alc. Only when the soln. of II in the AcOH-Ac_2O is poured into C_6H_6 does IV begin to sep. as quickly as when III is used; if it is poured into H_2O before the crystals have begun to sep., the AcOH dissolves and there seps. as an oil a soln. of the base (and probably the mono-Ac deriv.) in Ac_2O; the acetylation continues in spite of the surrounding H_2O, the oil slowly becoming tarry and finally hard, and boiling alc. then extg. from it acetylation products m. 187° to 233°. Pouring into dil. HCl also does not interrupt the acetylation, once it has been started, and in fact I or II in aq. HCl can be acetylated to IV with Ac_2O in the cold; in this case there is no difference between I and II in the velocity of acetylation. The diminished reactivity of the NH_2 groups in II can also be shown, although not so markedly, with other reagents. With 1 mol. HCHO I gives the anhydro compd. in 1, II in 2.5–3 min.; as the quantity of HCHO is increased the differences in reaction velocity become less but are still distinct. BzH behaves in the same way It is not surprising, therefore, that II is more weakly basic than I although it contains 1 more salt-forming group; II in AcOH is hydrolyzed when poured into H_2O and about 20% of it crysts. out, whereas I under the same conditions remains in soln. To explain these mol. complexes and especially their hindering influence on the reactions of the I the conception of partial valences does not suffice. A more satisfactory explanation is that it is the accumulation of C_6H_6 and $PhNH_2$ nuclei in the I which attracts the extra C_6H_6 or $PhNH_2$ mol. like the force between 2 bodies with elec. charges of the same sign but different magnitudes which are brought together mechanically. This does not exclude the possibility that there are still other forces, *e. g.*, forces such as those between 2 charged bodies with opposite polarities. It has thus far not been possible to obtain a $PhNMe_2$ addn. product of leucomalachite green (V) but it is a well-known fact that $PhNMe_2$ cannot be completely sepd. from V by steam distn. unless alkali is added. On the other hand, if leucomethyl violet (VI) solns. in 5 parts hot $PhNMe_2$ are cooled the quantity of crystals which sep. decreases with time and the filtrates, which still contain about 0.5 of the VI, give only minimal ppts. with MeOH, a fact which might be explained by the formation of a $PhNMe_2$ compd. more sol. than the VI itself. The crystals, carefully washed with MeOH, m. 173° like VI but when large quantities are fused the distn. of $PhNMe_2$ in droplets can be distinctly observed;

with steam, nothing distils from these crystals but if alkali is added or, better, if they are dissolved in HCl and then treated with alkali, a strong odor of $PhNMe_2$ at once develops and about 10% of the quantity of $PhNMe_2$ calcd. for 1 mol. distils off. Between the extremes II and V.$PhNMe_2$ lie intermediate substances. Thus *o-chlorodiaminotriphenylmethane* (VII) yields a well-crystd. $PhNH_2$ compd., which, however, loses its $PhNH_2$ on crystn. from alc. The C_6H_6 compd of *m-nitrodiaminotriphenylmethane* (VIII) is slowly acetylated and its di-Ac deriv holds 1 mol. AcOH so firmly that even crystn. from alc. does not completely remove the AcOH. The attraction of I for $PhNMe_2$ is materially less than that for $PhNH_2$; I holds only 0.5 mol. $PhNMe_2$. *m-* and *p-chloro-* and *o-*, *m-* and *p-hydroxytriphenylmethanes* and their C_6H_6 and $PhNH_2$ compds. have been prepd.; the latter behave on acetylation like the C_6H_6 and $PhNH_2$ compds. of I (with p-$HOC_6H_4CH(C_6H_4NH_2)_2$ no Ac deriv. seps. because it is too sol.). In the three HO compds., no acetylation of the HO group occurs even in boiling Ac_2O. I combines with other aromatic bases having no occupied *p*-position (o-$ClC_6H_4NH_2$, o-$MeC_6H_4NH_2$, m-$C_6H_4(NH_2)_2$), also with C_5H_5N, piperidine and tetrahydroquinoline, but not with o-$C_6H_4(NH_2)_2$, the three $O_2NC_6H_4NH_2$ and $H_2NC_6H_4CO_2H$, the two $C_{10}H_7NH_2$, Ph_2NH and $PhCH_2NH_2$. It also combines with a large no. of non-basic substances (PhMe, PhCl, o-ClC_6H_4Me, thiophene, PhOH, cresol and the constituents of naphtha but not *p*-disubstituted compds. nor m-ClC_6H_4Me, PhCN, Ph_2, $PhSO_3H$ and nitrated hydrocarbons). In the presence of enough $PhNH_2.HCl$ I is phenylated by $PhNH_2$ at 130-40°, as shown by the evolution of NH_3 and by the production of a green color on oxidation of the product; it has not been possible to obtain the latter in cryst. form but its compn indicates that it is a mono-Ph deriv. *o-Toluidine compd* of I, m. 130°; III, m. 106° only on rapid heating, the m. p rising up to around 130° the more slowly the compd. is heated; *PhMe compd.*, m. 100-1°. *Aniline compd.* of VII, m. 92-3°; *benzene compd.*, m. 79°; *PhMe compd.*, m. 73°. *Aniline compd.* of p-$ClC_6H_4CH(C_6H_4NH_2)_2$, m. 109°; *benzene compd.*, m. 96-8°. VIII, m 157°; *aniline compd.* (26 g. from 10 g. m-$O_2NC_6H_4CHO$, 33 g. $PhNH_2$ and 14 g. $PhNH_2.HCl$ at 140°), brown, m. 108°; *benzene compd.*, light yellow, m. 76°; *di-Ac deriv.*, crystals with 1 AcOH, m. 166° (loss of AcOH), then solidifies and m. again 204°. o-HOC_6H_4-$CH(C_6H_4NH_2)_2$, m. 150°; *aniline compd.* (16 g. from 10 g. o-HOC_6H_4CHO), m. 125°; *benzene compd.*, m. 76°; *di-Ac deriv*, m. 187°. m-$HOC_6H_4CH(C_6H_4NH_2)_2$, m. 172°; *aniline compd.* (24 g. from 10 g. m-HOC_6H_4CHO), m. 138°; *benzene compd.*, yellow, m. 106° (loss of C_6H_6) and again 172°; *sulfate; di-Ac deriv.*, m. 216°, sol. in dil. alkalies. p-$HOC_6H_4CH(C_6H_4NH_2)_2$, m. 178°; *aniline compd.* (yield, about 70%) faintly reddish, m. 153°; *benzene compd.*, m. 121° (loss of C_6H_6) and again 178°; *di-Ac deriv.*, m about 194°, sol. in alkalies. *Compds.* of I with: *m-chloroaniline*, m. 92°; *m-phenylenediamine*, m. 46.5°; *dimethylaniline*, I.0.5$PhNMe_2$, m. 142.5°; *pyridine*, m. 142°; *PhCl*, m. 108-9°; *o-chlorotoluene*, m. 108-12°; *thiophene*, sinters 86°, m. 110° (effervescence) and again 139°; *PhOH*, m. 110°; *o-cresol*, m. 97-8° (?) (97-89° in the original.—Abstr.); *piperidine*, m. 112-6°. C. A. R.

New iodo derivatives of phthaleins. Frederick R. Greenbaum. *Am. J. Pharm.* **100**, 374-85(1928).—The 2 different isomers of *tetraiodophenolphthalein*, α and β, were prepd., the former by the well-known method of Classen and Loeb (*Ber.* **28**, 1610(1895)) and the latter by fusing $C_6I_4(CO)_2O$ prepd. according to D. R. P. 50,177, Jan. 1889 (*Friedländer*, **1**, 93), with phenol. The α-isomer is an amorphous white powder, insol. in cold or hot H_2O and insol. in acids, sol., however, in hot EtOH, in ether and other org. solvents and sol. in dil. alkalies with a blue color which disappears on addn. of more alkali. It decomps. 220°, giving off vapors of I. Analysis for I gave 61.6% (calcd 61.8%). Di-Na salt of the β-isomer gave 57.75% I on analysis (calcd. for $C_{20}H_8O_4I_4Na_2$, 58.6% I). The free β-compd. is an amorphous powder insol. in cold or hot H_2O, insol. in all common org. solvents but sol. in alkalies with a pink to a reddish color which disappears on addn. of strong alkalies. From this compd. the *octaiodophenolphthalein* was prepd. as follows: 20 g. of the β-tetra-I compd. in excess alkali was treated with 72 g. of I in 84 g. of 20% NaOH with stirring and then heated to boiling, gradually acidified by adding in a fine stream glacial AcOH, with const. stirring, boiled for 0.5 hr., neutralized with NaOH, then rapidly acidified with HCl, again heated to a boil, allowed to settle, decanted, and filtered; the ppt. was washed with H_2O until free from acid, redissolved in NaOH, $NaHSO_3$ added and the soln. acidified, which pptd. the I compd. and at the same time liberated SO_2 from the $NaHSO_3$, this removing any free I included in the ppt. of octa-I compd. The ppt. was then filtered off, washed thoroughly with H_2O until free from acid or any other impurities and dried in a vacuum desiccator to const. wt. The analysis gave 76.25% for I (calcd. 76.60%). The compd. is a yellow cryst. substance insol. in cold or hot

H_2O, easily sol. in dil. alkalies, the soln. having a faint greenish color. On account of its high mol. wt. (1326) and its high content of I it is particularly suitable for experimentation in choleocystography. For the next iodophthalein prepd., 40 g. of dinitrophenolphthalein in 40 g. of 20% NaOH and 300 g. of H_2O was boiled and filtered, then mixed with 120 g. of unsublimed I in 140 g. of 20% NaOH and 300 g. of H_2O and slowly treated with 125 g. of glacial AcOH with stirring. This liberated I in a finely suspended state and the substitution then took place. The mixt. was boiled for about 0.5 hr., then 85 g. of 20% NaOH was added to neutralize the AcOH, and the soln. was rapidly acidified with 125 g. concd. HCl and 125 g. of H_2O, boiled for a short time, allowed to settle, the supernatant I soln. decanted, the ppt. washed with hot H_2O, filtered and washed again with H_2O until the wash H_2O was almost colorless. Then the ppt. was dissolved in dil. NaOH. filtered and pptd. with concd. HCl. This ppt. was filtered off and redissolved in NaOH, repptd. and washed free from HCl. If necessary $NaHSO_3$ was added before acidifying it, and then HCl added; this removes the free I present. This yellow ppt. of *diiododinitrophenolphthalein* was thoroughly dried on a steam bath and then in a desiccator. It is a light yellow amorphous powder, m. 249-50°, insol in cold and hot H_2O, sol. in NaOH with an orange color, insol. in the usual org solvents, sol. in glacial AcOH. The next higher homolog of phenolphthalein, *viz.*, fluorescein, was nitrated according to Beilstein, 2, 2064(1896 ed). The introduction of I into the resulting dinitrofluorescein gave a new deriv., *dinitrodiiodofluorescein*, $C_{20}H_8O_9N_2I_2$, which was prepd. in exactly the same way as the phthalein This method of introduction of I as described above proved satisfactory in all fluorescein derivs. and in many other phthaleins. *Diiododinitrofluorescein* is an orange-red amorphous powder insol. in cold and hot H_2O, sol. in EtOH and MeOH and sol. in ether, sol. in NaOH with a blue color and repptd. on acidification. From *m*-cresolphthalein prepd. in the same way as *o*-cresolphthalein (*Beilstein*, 2, 1987(1896 ed.)), *diiodo-m-cresolphthalein* was obtained in the following manner: 10 g. of *m*-cresolphthalein was dissolved in an excess of NaOH, filtered, treated slowly with 20 g. of I and 20 g. of KI in 100 cc. of H_2O with stirring for 2 hrs., acidified with HCl, filtered, washed, redissolved in NaOH and repptd. with HCl. This procedure was repeated twice, and the ppt. filtered and washed with H_2O to free it from HCl and dried on a steam bath. The *di-I-compd.* is a brown amorphous powder, m. 214°, insol. in cold and hot H_2O, insol in ether, somewhat sol. in EtOH and MeOH, very slightly sol. in dil. NaOH; on heating it dissolves with dark brown color. It is interesting to note that this exhaustive method for introduction of I does not furnish a tetra-I deriv. as would be expected, but only a di-I compd. in spite of the fact that the 4 *o*-positions are not occupied. The next compd. tried was rhodamine B, the com. compd. available in tetraethyldiaminophenolphthalein-HCl. This rhodamine B was treated by 2 methods for the introduction of I. The direct addn. of I in KI to an alk. soln. of rhodamine B resulted in a monoiodorhodamine (calcd. N 4.90, I 23.3; found 4.6, 22.7%). It is of course clear that this is an unsatd. compd. but every attempt to introduce more I by the use of this method failed. At last the following method was tried and resulted in a *diiodorhodamine B:* To 2.2 g. of highly purified rhodamine B in 200 cc. of H_2O, 2.3 g. of ICl_3 in 100 cc. of H_2O contg. 10 cc. of concd. HCl was added. Immediate pptn. of a reddish flocculent compd. occurred. This was filtered off and washed with H_2O until all the acid was removed, then dried and analyzed: calcd. N 4.0, I 36.4; found 3.9, 36.3%. It is a reddish brown powder, somewhat sol. in cold and hot H_2O, insol. in dil. alkalies, insol. in acids, very sol. in ether, in MeOH and in EtOH. The last phthalein which was included in this study was thymolphthalein. 8.6 g. in 8.0 g. of boiling 20% NaOH and 60 g. of H_2O, was treated with 24 g. of I in 28 g. of 20% NaOH and 60 g. of H_2O, boiled for 0.5 hr., AcOH added, the soln. boiled again, neutralized with NaOH, acidified with HCl, boiled and filtered and the ppt. purified and dried on a steam bath and in a desiccator. In spite of this vigorous I-introduction method only a mono-I compd. resulted, and attempts to use ICl_3 and ICl resulted in the same mono-I compd. as the analysis shows (found, 23.96% I). *Monoiodothymolphthalein* is a brown amorphous powder insol. in cold or hot H_2O, sol. in common org. solvents, sol. in alkalies with a blue color. W. G. Gaessler

Mercuration of naphthalene derivatives. Jerzy Krynski. *Roczniki Chem.* 8, 71-87(1928); cf. Dimroth, Ueber direkte Einfuehrung von Quecksilber in aromatische Verbindungen, Tuebingen, 1900; Pesci, *Rend. accad. Lincei* [5], 1, 312 (1928).—The mercuration was carried out by heating equimol. parts of the org. compd. and Hg salt: (*a*) in AcOH with $Hg(OAc)_2$; (*b*) in NaOH with freshly pptd. $Hg(OH)_2$ and isolation as acetate; (*c*) by melting together without a solvent in the open or sealed tube until H_2S ppts. a white sulfide. *1-Hydroxy-2,4-diacetatomercuri-*

naphthalene, m. 140°, was obtained by (*a*) from α-naphthol. It yields on bromination *1-hydroxy-2,4-dibromonaphthalene*, m. 105°. Water gradually turns the color to yellow and yellowish green, probably with the formation of *4-acetatomercuri-2-mercuri-1-naphthoquinone*,  or , with 66.67% Hg (calcd. 66.75%). *1-Acetatomercuri-2-hydroxynaphthalene*, m. 168–70°, was obtained by (*a*) and (*b*). It yields on iodination *1,2-I(HO)$C_{10}H_6$*, m. 94.5°. When a stream of CO_2 is passed through the alk. soln. *1-mercuri-2-naphthoquinone*,  (I)  (II), with 58.36% Hg (calcd 58.55%) is formed. II is more probable since the compd. is colorless. When the aq. $Hg(OAc)_2$ and 1,4-$C_{10}H_6(OH)NO_2$ are mixed the red amorphous salt *$C_{10}H_6(NO_2)OHgOAc$* with 44.80% Hg is formed. The yellow cryst. *1-hydroxy-2-acetatomercuri-4-nitronaphthalene* is prepd. by heating the salt or directly by (*a*). It m. 216–8° with explosion. Iodination leads to *1-hydroxy-2-iodo-4-nitronaphthalene*, m. 115°, yellow. 1-Hydroxy-2-nitro-4-acetatomercurinaphthalene, contg 44.94% Hg, yellow, m. 185°, obtained by (*c*) yields on iodination 1-hydroxy-2-nitro-4-iodonaphthalene, m. 145–6°. *1-Acetatomercuri-2-ethoxynaphthalene*, m. 103–4° (47.02% Hg, prepd. by (*c*) from nerolin, yields on bromination *1-bromo-2-ethoxynaphthalene*, m. 66°. H_2S ppts. white needles from the ether soln. probably of *1,1-dimercuri-2,2-diethoxynaphthalene sulfide* $[C_{10}H_6(OEt)Hg]_2S$ (51.67% Hg, 3.93% S; calcd. 51.75% Hg, 4.13% S). *1-Acetatomercuri-2-bromonaphthalene* prepd. by (*c*), light yellow, m. 128–30°, is brominated to 1,2-$C_{10}H_6Br_2$, m. 68°. *1-Mercuriaminonaphthalene*, $C_{10}H_7NHg$, from 1-NH_2-$C_{10}H_7$ by (*a*), m. 203° (decompn.). H_2S splits all Hg off as HgS. 2,2-Dinaphthylamine yields by (*a*) *1,1-diacetatomercuri-2,2-dinaphthylamine*, m. 198°. In 40% AcOH H_2S ppts. a white sulfide which gradually turns black. Attempts at elimination of 1 Hg and ring closure always resulted in the elimination of both Hg. Iodination leads to *1,1-diiodo-2,2-dinaphthylamine*, m. 165–6° (decompn. and liberation of I). Conclusions: The mercuration of naphthols and derivs of naphthylamines and sulfonamides is comparatively easy, that of Cl derivs difficult, that of 1-$C_{10}H_7NO_2$ impossible. The Hg enters in the *o*- or *p*-, never in the *m*-position. The introduction of Hg follows the rules established by Vessely and Jakes (*C. A.* **18**, 253) for Cl, NO_2 and SO_3H. The stability depends on the other substituents. Hg is easily replaced by halogen, which makes the compds valuable intermediates. MARY JACOBSEN

Dioximes. L. G. PONZIO. Univ. Turin. *Ber.* **61B**, 1316–28(1928).—The only recorded exptl. confirmation of the Hantzsch-Werner theory that glyoximes should exist in 4 forms (1 *syn*, 1 *anti* and 2 *amphi*) is the work of Meisenheimer, Lange and Lamparter (*C. A.* **19**, 2819), who report having obtained *p*-$MeOC_6H_4C(:NOH)C(:NOH)$-Ph in 4 forms, m. 206–7°, 176°, 89–91° and 114–5°, resp. They were apparently unaware that P. (*C. A.* **18**, 1490) had described a dioxime of the same structure whose m. p., 223°, was unchanged by recrystn. or by converting the dioxime into its complex Ni salt or di-Bz deriv. and regenerating it with dil. H_2SO_4 or NaOH, resp. Moreover, M., L. and L. prepared their 206–7° compd. by a reaction which also gives the 176° form at the same time, so it is possible their product was impure, whereas the homogeneity of the P. compd. was insured not only by what has been said above but also by the prepn. of an identical product from *p*-$MeOC_6H_4N_2Cl$ and PhC(:NOH)-CH:NOH, a reaction which can give only 1 product. The existence of M., L. and L.'s 3 other products is therefore also doubtful. Moreover, the results of the present work seem to show beyond doubt that the Hantzsch-Werner theory cannot hold for the glyoximes MeC(:NOH)C(:NOH)R (R = Ph, C_6H_4Br or C_6H_4OMe). Of these, only 2 forms had hitherto been known (α and β). The higher-melting β-forms yield complex Ni salts insol. in dil. AcOH and can be obtained by heating the α-forms. Dehydrogenation of the β-dioximes gives 2 peroxides; the higher melting of these on reduction by the Angeli method give exclusively the α-dioximes, while the lower-melting peroxides give exclusively γ-glyoximes which even at room temp. change into the

β-glyoximes. The 2 peroxides are not isomorphous and show entirely different chem. behavior. The higher-melting form on heating changes irreversibly into its isomer, reacts vigorously with PCl_5 with loss of O and formation of the furazan, and is converted by NaOEt into an isomer sol. in bases, while the lower-melting peroxide reacts with neither PCl_5 nor NaOEt and can in no way be converted back into the higher-melting form. Independently of any preconceived notion as to the nature of the isomerism of the glyoximes from which these peroxides are obtained by dehydrogenation and into which they are converted by reduction, P. believes that the higher-melting peroxide is a furoxan (I) and that of the 3 possible formulas for the low-melting isomer

MeC—CAr (O:N.O.N) (I) MeC- -CAr (N.O.O.N) (II)

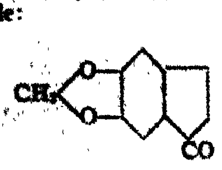
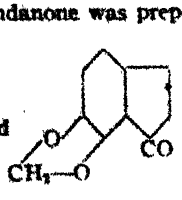
II is the most probable. Since the β-glyoxime on dehydrogenation yields both the furoxan (I) and the peroxide (II) it should, according to the Hantzsch-Werner theory, have both the *amphi*- and the *syn*-configuration, and the α-glyoxime, which gives II exclusively, should also have the *syn*-configuration. The above facts are readily explained, however, if it is assumed that in the glyoximes 1 of the oximino groups assumes the nitrone form, =N(:O)H, toward certain reagents. The β-glyoxime could then be represented by the equil. MeC[:N(:O)H]C(:NOH)Ar ⇌ MeC(:NOH)C(:NOH)Ar, the α-compd. would be MeC[:N(:O)H]C(:NOH)Ar and the γ-glyoxime MeC(:NOH)C(:NOH)Ar. The β-form of MeC(:NOH)C(:NOH)Ph m. 238–9° (partial sublimation and decompn.). Methylphenylfuroxan (I, Ar = Ph) (5–6 g. (with 2 g. II) from 10 g. of the glyoxime in NaOH with NaOCl or 4–5 g. (with 1 g II) from 10 g. of the glyoxime in Et_2O with N_2O_4), m. 96°, converted by NaOEt in hot alc. into an *isomer*, m. 178–9° (decompn.), sol. in bases. The *peroxide* (II, Ar = Ph), best prepd. by gently refluxing the I in Ac_2O, m. 62°, slowly volatile with steam, sol. without color in concd. H_2SO_4, repptd. unchanged by H_2O, unchanged by boiling alc. NaOEt. The *γ-glyoxime* changes so readily into the β-form that it has not yet been obtained pure; with NaOH-NaOCl it gives II quant Methyl-*p*-methoxyphenylfuroxan (I, Ar = $MeOC_6H_4$), m. 99°; *peroxide*, m. 78°; *di-Bz deriv.* of α-methylanisylglyoxime, m. 157–8°. *Methyl[bromoanisyl]furoxan*, m 109°; *peroxide*, m. 115–6°; alkali-sol. *isomer*, m. 180° (decompn.). *Methyl[nitroanisyl]furoxan*, m. 88°; *peroxide*, m. 112°; furazan, straw-yellow, m. 96–7°. *β-Methyl-[p-bromophenyl]glyoxime*, m. 223–4° (partial decompn.), forms an orange Ni salt insol. in dil. AcOH; *furoxan*, m. 108–9°; alkali-sol. *isomer*, m 179° (decompn.); *peroxide*, m. 88–9°. C. A. R.

Action of ethylmagnesium bromide on acenaphthoquinone. NICOLAS MAXIM. *Bull. soc. chim.* **43**, 769–78(1928).—EtMgBr was prepd. from 8 g. of Mg, 40 g. of EtBr and 100 g. of Et_2O and to this was slowly added 15 g. of *acenaphthoquinone* (I). The mixt. was heated for 4 hrs. and after 12 hrs. the product was poured into cooled 20% H_2SO_4 soln., pptg. *9,10-diethylacenaphthoglycol* (II), m. 197°. By refluxing 1 g. of II in 20 g. of HOAc for 4 hrs. and then adding 5 g. of concd. HCl and a large vol. of water, yellow crystals of *9,10-diethylideneacenaphthene* (III) were formed, m. about 140°. This behavior of II upon dehydration is unlike that of the *di-Ph deriv.*, which yields a pinacolin under this treatment (*C. A.* **4**, 912). III was oxidized to I by boiling 1 g. in 10 g. of HOAc with slow addn. of 6 g. of $Na_2Cr_2O_7$. I crystd. out upon the addn. of H_2O and was purified by dissolving in satd. $NaHSO_3$, filtering and repptg. by heating with dil. H_2SO_4

$C_{10}H_6<(CO)(CO)$ (I) $C_{10}H_6<(CEtOH)(CEtOH)$ (II) $C_{10}H_6<(C:CHMe)(C:CHMe)$ (III)

A. S. CARTER

Synthesis of the indanone of the heliotropin (piperonal) series. FRIGYES KONEK AND MIKLÓS JANOVICS. *Matematik. Természettudományi Értesitö* **42**, 210–21(Hung.), 222–3(Ger.)(1926).—By the Perkin reaction piperonal was converted into the corresponding disubstituted cinnamic acid. The side chain was satd. and by the condensation with P_2O_5 in C_6H_6 the corresponding indanone was prepd. Two structures are possible:

 (I) and  (II)

I was proved correct by the oxidation of the oxime of the indanone into the corresponding methylene ether of phthalic acid which was identical with hydrastic acid prepd. by the oxidation of hydrastinine. J. S. REICHERT

Periodo-alkali salts with organic neutral components. HANS SCHMIDT. Techn. Hochschule Berlin. *Ber.* **61B**, 1347–53(1928).—Löwenbein and S. had observed (*C. A.* **22**, 71) that 3-aryl-3-bromocoumaranones with NaI in Me_2CO liberate I and yield the corresponding free radicals or their association products, the bis-[2-keto-3-aryl-3,3′-coumaranyls], $(C_{10}H_6.O.CO.CPh-)_2$, but on working cautiously there were noted, as intermediate products, intensely green, shimmering needles which rapidly lost I in the air. These green I compds. (I) are the subject of the present study. Pure solns of I and NaI in Me_2CO when evapd. in a vacuum desiccator yield light green needles; concd. solns after a time change into a cryst. magma, also pptd. from more dil. solns. by petroleum ether. The crystals are somewhat lighter in color and smaller and have a much weaker metallic luster than the I; they are also more stable, split off I much less rapidly and become greenish gray in the air; on ignition they leave a residue of NaI and in H_2O dissolve with clear brown color. Analysis indicates that they have the compn. $[(Me_2CO)_6I](NaI)_3$. Hot solns. of I and NaI in AcOH deposit green needles on cooling and concg. To prep the I, the 3-aryl-3-bromocoumaranone in Me_2CO is treated with a concd. (about 15%) soln. of NaI in Me_2CO, filtered from the NaBr and concd. in a vacuum desiccator to a small vol. They must be filtered and washed as rapidly as possible and placed in specimen tubes still moist with Me_2CO. They cannot be dried, forming brown tars in a few min. when spread on clay. All decomp. around 65°. On heating in the air they evolve I vapors and leave a residue of C and Na salt. H_2O, which on boiling splits off all the I and NaI, and solvents decomp. them. They dissolve best in liquids with large dielec consts. The color of the solns. is generally orange-red, especially in ionizing media, which split off little I; with ligroin, there is no soln., yet the violet color of I readily appears. The I can be crystd. only from Me_2CO, best from concd. I-NaI solns. In every case the Na content confirmed the view that the I are NaI addn. products, $(RI)_m(NaI)_n$, of 3-aryl-3-iodocoumaranones formed primarily. The values varied for different compds. and fractions; evidently varying quantities of NaI combine, depending on its concn. Because of the dissocn. of the I in solvents, their mol. wts. could not be detd. with certainty. In the dry state and in soln. they split off I and the resulting free org. radicals combine with each other: $(RI)_2(NaI)_n \longrightarrow 2R\ .\ .\ .\ + I_2 + (NaI)_{2n} \longrightarrow RR + I_2 + (NaI)_{2n}$. Hence, from solns contg much RI and little NaI the dimeric radicals sep. on rubbing with a glass rod, a reaction which can be utilized for isolating the radicals or their assocn. products, especially when other methods fail, $Na_2S_2O_3$ or metals being used to bind the active I. The simple ester-like 3-aryl-3-iodocoumaranones can no more be obtained from the I than from the free radicals, as all NaI solvents also attack the organically combined I. The properties of the I show that they are beyond doubt true salts comparable to the alkali iodide-heavy metal iodide double salts, the alkali metal probably functioning as the cation, $[(RI)_xI]Na$. The following *2-ketocoumaranylperiodosodium compds.* were prepd.: *3-Ph*, $3C_{14}H_9O_2I.2NaI$; *3-phenyl-5-methyl*, $2C_{15}H_{11}O_2I.3NaI$; *3-p-anisyl-5-methyl*, RI.3NaI; *3-phenyl-4,5-benzo*, RI.3NaI, RI.2NaI; *3-p-anisyl-4,5-benzo*, 2RI.3NaI, RI.2NaI. C. A. R.

2,3-Thionaphthene-4-keto-γ-pyran 5,6-dihydride. F. KROLLPFEIFFER AND K. SCHNEIDER. Univ. Marburg. *Ber.* **61B**, 1284–91(1928).—While ring closure in β-phenoxypropionic acids gives the alkali-insol. chromanones, the chloride of *β-[thionaphthenyl-3-oxy]propionic acid* (I) with $AlCl_3$ yields *2,3-thionaphthene-4-keto-γ-pyran 5,6-dihydride* (II), which, although insol. in cold aq. alkalies, dissolves completely with yellow color on gentle warming. Its structure was confirmed by its prepn. from *2-[β-chloropropionyl]-3-hydroxythionaphthene* (III) cautiously treated with 10% Na_2CO_3. A gently warmed alk. soln. of III gives with acids the same compd., *2-[β-hydroxypropionyl]-3-hydroxythionaphthene* (IV), as do alk. solns. of II. While, therefore, the ketodihydropyran ring in the 2,3-benzo derivs. (the chromanones) is quite stable towards alkalies, in II it is easily ruptured. Moreover, unlike the chromanones, whose 3-H atoms are very reactive towards BzH and Br, II forms no benzal deriv. and only with excess of undild. Br does it yield a *mono-Br deriv* (V), whose Br cannot be split off with boiling $PhNMe_2$. On heating with alkali, especially if previously moistened with alc., V dissolves with yellow color and acids ppt. a substance still contg. Br but different from V; its compn. and the behavior of its alc. soln. with $FeCl_3$ (olive-green color) indicate that it is a mono-Br deriv. of IV but lack of material prevented a detn. of its structure; apparently the Br is on the C_6H_4 nucleus. Attempts to synthesize

it from the brominated hydroxythionaphthenes have given no satisfactory results but it was observed in this connection that *o-[ω-bromoaceto]-p-thiocresol Me ether* (VI) changes with extraordinary ease, with loss of MeBr, into 5-methyl-3-hydroxythionaphthene (VII) on heating, either above its m. p. or in solvents (AcOH, PhMe), in fact, on distn. with steam. In the corresponding *I compd.* (VIII) 80% of the I distd. over as MeI in the Zeisel MeO detn. and 13% more was found in the H_2O used for boiling. *o-[α-Bromopropionyl]-p-thiocresol Me ether* (IX) likewise splits off MeI on distn. with steam, forming various substances whose structure has not been detd. As was to be expected from the lesser tendency of the coumaranone ring to be formed *o-[α-bromoaceto]-p-cresol Me ether* (X) distils unchanged with steam and loses no MeBr even above its m. p. I (2.5 g. from 10 g. 3-hydroxythionaphthene (XI) in 45% cold KOH with concd. aq. $ClCH_2CH_2CO_2H$), m. 164–5°. II, b_{12} about 205°, m. 144–5°, sol. in concd. H_2SO_4 with yellow color; *semicarbazone*, m. 229–30°. IV, faintly yellow, m. 129–30°, gives an olive-green color with $FeCl_3$ in alc. and yields with PhNCO a *carbanilate*, $C_{25}H_{20}O_3SN_2$, m. 148–50°. 2-Acetyl-3-hydroxythionaphthene, m. 82°, was obtained from the Me ether of XI and AcCl in CS_2 with $AlCl_3$. *2-EtCO deriv.*, b_{15} 183°, m. 73–4°; *semicarbazone*, faintly yellowish, m. 188–9°. III, m. 121–2°, gives the 2-EtCO deriv. above with Zn dust in boiling AcOH. 2-Bz deriv., golden yellow needles, often with red cryst. aggregates, m. 118–9°; phenylhydrazone, m. 167–8°. V, $C_{11}H_7O_2BrS$. m. 189–90°, sol. in concd. H_2SO_4 with orange color, gives on heating with 2 *N* NaOH and acidifying a substance $C_{11}H_9O_3BrS$, m. 135–6°. VI (with H. Schultze), obtained from 4,2-$MeAcC_6H_3SMe$ and Br in CS_2, yellow, m. 77–8° (with AcOH as the solvent, the product is a halogen-free orange substance m. 226–7°); its soln. in AcOH on refluxing soon becomes red and deposits a small quantity of 5,5′-dimethylthioindigo. VIII, from VI in Me_2CO with KI at room temp., m. 86–7°. *o-Propionyl-p-thiocresol Me ether* (6 g. from 10 g. p-MeC_6H_4SMe with EtCOCl and $AlCl_3$), b_{19} 176–7°, m. 42–3°. IX, faintly yellow. m. 98°. X, m. 74–5°. C. A. R.

Oxidation. I. Action of ferric chloride and hydrogen peroxide on thiosemicarbazones and the synthesis of thiodiazoles and triazoles. SATISH CHANDRA DE AND SATYENDRA K. ROY-CHOUDHURY. Dacca Univ. *J. Indian Chem. Soc.* 5, 269–78 (1928).—Thiosemicarbazones have been oxidized with $FeCl_3$ (I) and H_2O_2 (II) to det. whether mercaptotriazoles are formed. PhCH:NNHC(SH):NH (III) with I gives exclusively 5-phenyl-2-amino-1,3,4-thiodiazole, m. 213–4°. PhCH:CHCH:NNHC(SH):NH with I gives solely *PhCH:CHC:N.N:C(NH₂).S*, m. 260–1°. Salicylaldehyde 4-phenylthiosemicarbazone with I gives *5-salicyl-2-anilido-1,3,4-thiodiazole*, m. 190–1°, *m*-nitrobenzaldehyde phenylthiosemicarbazone gives *5-m-nitrophenyl-2-anilido-1,3,4-thiodiazole*, m. 249–50° (*Ac deriv.*, m. 246°). Further 1,3,4-thiodiazoles similarly prepd. were: *5-p-tolyl-2-phenyl*, m. 198–9° (*Ac deriv.*, m. 155°); *5-p-nitrophenyl-2-p-toluidino*, m. 197–8° (*Ac deriv.*, m. 243°); *5-styryl-2-p-toluidino*, m. 184°; *5-phenyl-2-allylamino*, m. 114–5° (*Ac deriv.*, m. 120°); *5-m-nitrophenyl-2-allylamino*, m. 170–1°; *5-p-nitrophenyl-2-m-toluidino*, m. 257°; *5-phenyl-2-m-toluidino*, m. 176°; *5-m-nitrophenyl-2-o-toluidino*, m. 247–8°; *5-m-nitrophenyl-2-methylamino*, m. 201° (*Ac deriv.*, m 225–6°, *Me deriv.* (using MeI), m. 209°); *5-p-nitrophenyl-2-methylamino*, m. 262° (*Ac deriv.*, m. 279°, *Me deriv.*, m. 203°); *5-o-nitrophenyl-2-m-xylidino*, m. 229°; *5-m-nitrophenyl-2-m-xylidino*, m. 205° (*Ac deriv.*, m. 197–8°); *5-o-nitrophenyl-2-β-naphthylamino*, m. 202°; *5-phenyl-2-ethylamino*, m. 238–40°. III in alc. with an aq. soln. contg. an excess of II gives 5-phenyl-1,3,4-triazole, m. 177°. *o*-Nitrobenzaldehyde 4-*m*-xylylthiosemicarbazone in alc. with II gives *5-o-nitrophenyl-2-thiol-1-m-xylyl-1,3,4-triazole disulfide* (IV), m. 201–3°. The

$$\left[\begin{array}{c} \text{N}\text{———————}\text{N} \\ \| \qquad\qquad \| \\ \text{O}_2\text{NC}_6\text{H}_4\text{C.N}(\text{C}_6\text{H}_3\text{Me}_2)\text{.C—} \end{array}\right]_2 \text{S}_2 \qquad \begin{array}{c} \text{N—N} \\ \| \quad \| \\ \text{Me}_2\text{C:NNHC.S.C.NHN:CMe}_2 \end{array}$$

(IV) (V)

following *2-thiol-1,3,4-triazole disulfides* were similarly prepd.: *5-Ph*, m. 90°; *5-phenyl-1-p-tolyl*, m. 155–6°; *5-phenyl-1-ethyl*, m. 88°; *1,5-diphenyl*, m. 232° (decompn.); *5-m-nitrophenyl-1-allyl*, m. 173°. Acetone thiosemicarbazone in alc. with II gives *2,5-diacetonehydrazido-1,3,4-thiodiazole* (V), m. 260° (decompn.). Similar 1,3,4-thiodiazoles prepd. were the *2,5-diacetonehydrazide-3,4-diphenyl deriv.*, m. 168° (decompn.) and *2,5-diacetonehydrazide-3,4-di-p-tolyl deriv.*, m. 124°. D. H. POWERS

Action of hydrazides. II. Synthesis of some bistriazoles from thiocarbohydrazides. SATISH CHANDRA DE. Dacca Univ. *J. Indian Chem. Soc.* 5, 373–9(1928); cf. *C. A.* 21, 3201.—The action of $CS(NHNH_2)_2$ and $CO(NHNH_2)_2$ on derivs. of phen-

anthraquinone is studied. 2-Bromophenanthraquinone (I) is heated with $CS(NH-NH_2)_2$-HCl (II) in HOAc for a few min. to give *2-bromophenanthraquinonethiocarbohydrazone*, m. 236°. The oxime of I was heated in HOAc for 0.5 hr. with II to give *2-thioketo-bis-5-bromophenanthro-1,2,3-triazole*, m. 145°. 2,7-Dibromophenanthraquinone (III) with II gives the corresponding *hydrazone*, m. 260°. The oxime of III with II gives the *triazole*, m. 210°. 2-Nitrophenanthraquinone with II gives the *hydrazone*, m. 220°, and its oxime gives the *triazole*, m. 200°. The 4-nitro deriv. gives the *hydrazone*, m. 155°. The 4,5-Br_2 deriv. gives the *hydrazone*, m. 270°, and its oxime the *triazole*, m. 235°. The 4,5-$(NO_2)_2$ deriv. gives the *hydrazone*, m. 162°, and its oxime gives the *triazole*, m. 160°. The 2,7-$(NO_2)_2$ deriv. gives the *hydrazone*, m. above 300°, and its oxime gives the *triazole*, m. above 295°. Phenanthraquinone (IV) heated with $CO(NHNH_2)_2$-HCl (V) in HOAc gives *phenanthraquinone carbohydrazone*, m. 285°. The oxime of IV with V gives *2-ketobisphenanthro-1,2,3-triazole*, m. 272°. I with V gives the *hydrazone*, m. 275°, and its oxime with V gives the *triazole*, m. 245°. The 2-nitro deriv. of IV with V gives the *hydrazone*, m. 280°, and its oxime the *triazole*, m. 192°. The 4-nitro deriv. gives the *hydrazone*, m. 240°, and its oxime the *triazole*, m. 200°. The 2,7-Br_2 deriv. gives the *hydrazone*, m. 295°, and its oxime the *triazole*, m. 210°; the 2,7-$(NO_2)_2$ deriv. gives the *hydrazone*, m. above 300°, and its oxime the *triazole*, m. 230°; the 4,5-$(NO_2)_2$ deriv. gives the *hydrazone*, m. 295°, and its oxime the *triazole*, m. 160°; the 4,5-Br_2 deriv. gives the *hydrazone*, m. above 300°, and its oxime the *triazole*, m. 273°.

D. H. Powers

Cyclic derivatives of acetonedicarboxylic acid. II. Effect of diazomethane on acetonedicarboxylic acid anhydride. J. Litvński and R. Malachowski. *Roczniki Chem.* **7**, 579–84(1927); cf. *C. A.* **21**, 1798.—CH_2N_2 prepd. by Staudinger's method was impure and gave on methylation considerably poorer yields than Pechmann's CH_2N_2 (2.2–2.4 g. from 10 cc. $N(NO)MeCO_2Et$). *4,6-Dimethoxy-α-pyrone*, $C_7H_8O_4$, prepd. by adding dropwise in a freezing mixt. 2.2–2.4 g. CH_2N_2 in ether to 2.7 g. acetonedicarboxylic anhydride (II) in ether (total 150 cc.), m. 105.5–6°, sol. in hot water, alc., $CHCl_3$, scarcely in ether. Yield 80%. The pure I remained several months unaltered. It does not react with enol reagents. I (23 g.) was heated 75 hrs. to 80° with 10 cc. abs. alc., the turbid product was dild. with ether after 12 hrs., decanted from unaltered I and distd. *in vacuo*. *Di-Me β-methoxyglutaconate*, b_{18} 138°, was obtained in 2 g. yield as a highly refractive oil. It is fairly stable to water and begins to give a color with $FeCl_3$ only after prolonged heating. It gives no ppt. with $Cu(OAc)_2$. Methylation of II with 1 mol. CH_2N_2 yields instead of the expected *mono-Me-ether* the diether and unaltered II. *4-Acetoxy-6-methoxy-α-pyrone* (III), obtained by treating 4-acetoxy-6-hydroxy-α-pyrone with CH_2N_2 (yield 70%), m. 66–7°, scarcely sol. in ether and ligroin, easily in other org. solvents, very instable, decomps. within a few days. It is easily sapond. by water instantaneously by Na_2CO_3 and dild. alkali. *4-Hydroxy-6-methoxy-α-pyrone*, $C_6H_6O_4$, (IV), obtained in 70% yield by adding to 14 g. III 100 cc. 2 *N* KOH at 0–5°, filtering rapidly, acidulating with 70 cc. 2 *N* H_2SO_4 at 0° and recrystg. from alc. (rapidly because it reacts), m. 146–7.5°, is hardly sol. in ether (0.120 g. in 100 cc. at 26°), ligroin, $CHCl_3$ and cold water, sol. in hot alc., decompd. by hot water, forms with alkalies and Na_2CO_3 the enolate from which it may be repptd. by acid, gives an orange color with $FeCl_3$, but no lignin reaction. After long standing in AcONa it reacts with PhN_2Cl to CO.O.C(OMe):CH.CO.C·NNHPh, golden platelets, m. 170–1°, sol. in $CHCl_3$ and ligroin. IV is methylated on prolonged heating with MeOH to *di-Me acetonedicarboxylate*, b_{11} 126°; *Cu salt* m. 163–5°. In ether IV reacts only slowly with CH_2N_2 but in MeOH it yields I. The soly. of II in ether is 0.694 g./100 cc. at 26°.

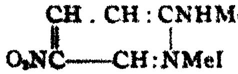
Mary Jacobsen

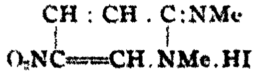
Optical resolution of a spirocyclic compound of the allene type. H. J. Backer and H. B. J. Schurink. *Proc. Acad. Sci. Amsterdam* **31**, 370–1(1928).—See *C. A.* **22**, 3145.

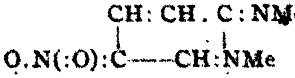
E. H.

Nitro derivatives of methylated forms of α-aminopyridine. II. A. E. Chichibabin and A. V. Kirsanov. *Ber.* **61B**, 1223–35(1928); cf. *C. A.* **20**, 396; **22**, 1975.—The compd. m. 181° (I) obtained from α,β'-$C_5H_3N(NH_2)NO_2$ (II) and MeI had, from analogy with the product obtained from α-$C_5H_4NNH_2$ and MeI, been assigned the structure of β'-nitro-*N*-methylpyridone imide (III), a structure apparently confirmed by the fact that I is also obtained in good yield by the isomerization of *N*-methyl-α-pyridone nitrimide (IV) with H_2SO_4. The formation of I by the isomerization of α-$C_5H_4NNMeNO_2$ was accordingly explained as consisting in a migration of the Me group from the amino N to the ring N. Further study, however, showed that the compd.

m. 60° (V) obtained by nitration of **I** in cold concd. H_2SO_4, which, from its method of formation, was apparently β'-nitro-*N*-methyl-α-pyridone nitrimide (VI), did not evolve N_2O with alkalies but, on boiling, regenerated **I**. Methylation of α,β'-C_5H_3N-$(NHNO_2)NO_2$ (VII) with alk. Me_2SO_4 yielded **V**, to be sure, but only in small yield, the chief product being an isomer (VIII), m. 182°, which with alkalies gave N_2O and β'-nitro-*N*-methyl-α-pyridone (IX) and which was therefore beyond doubt **VI**. A renewed and thorough study of the reactions of methylated derivs. of **II** and α,β-$C_5H_3N(NH_2)NO_2$ (X) has convinced C. and K. that the migration of the Me group on heating in H_2SO_4 occurs not in α-$C_5H_4NNMeNO_2$ but in **IV** and from the ring to the amino N atom, both α,β'- (XI) and α,β-$C_5H_3N(NHMe)NO_2$ (XII) being formed. There is no doubt that *the presence of NO_2 groups in 1 of the β-positions makes the addn. of MeI on the ring N atom more difficult;* when a Me group is already on the N atom, *the NO_2 group loosens the union of this Me group with the N atom.* Accordingly **II** (and also α,β-$C_5H_3N(NH_2)NO_2$ (XIII)), unlike α-$C_5H_4NNH_2$ itself, gives with MeI almost quant. the MeNH deriv. and not the pyridone imide and **I** is really **XI**. **XI** and **XII** with HNO_2 yield the stable NO derivs. α,β'- (XIV) and α,β-$C_5H_3N(NMeNO)NO_2$ (XV) and are readily brominated to α,β',β- (XVI) and α,β,β'-$C_5H_2N(NHMe)(NO_2)Br$ (XVII). That **XI** and **XII** are methylaminopyridines and not methylpyridone imides is confirmed by the fact that boiling with alkalies gives $MeNH_2$ and not NH_3, with formation of α,β'- (XVIII) and α,β-$C_5H_3N(OH)NO_2$ (XIX), likewise obtained, together with NH_3, from **II** and **X**. α,β'-$C_5H_3N(NMeNO_2)NO_2$ (V) with boiling alkalies first, yields **XI** and then, on longer boiling, **XVIII** and NH_3. When **VIII** is heated with H_2SO_4, not only does the NO_2 group migrate from the imide N but it is also partially split off and the Me group migrates from the ring N atom, so that both α,β,β'-$C_5H_2N(NHMe)$-$(NO_2)_2$ (XX) and **XI** are obtained. On the other hand α-$C_5H_4NNMeNO_2$ gives the same mixt. of **XI** and **XII** as does **IV**; moreover, the HNO_2 formed as by-product gives some **XV**. **V** and α,β-$C_5H_3N(NMeNO_2)NO_2$ (XXI) give **XX**. The difficulty in adding MeI to β-NO_2 derivs. of C_5H_5N is shown by the fact that **XVIII** and α,β'-$C_5H_3NCl(NO_2)$ do not combine with MeI even at 130° although β-$C_5H_4NNO_2$ itself at 100° yields a *methiodide* (XXII), blackens above 190°, m. 203° (decompn.). It is a striking fact that di-NO_2 derivs. of C_5H_4NNHMe and $C_5H_4NNMe_2$ are formed much more easily than that of $C_5H_4NNH_2$ itself; moreover, $C_5H_2N(NH_2)(NO_2)_2$ is formed very much more readily from **X** than from **II**. Again, when **XI** is warmed with MeI there is formed chiefly, together with only a little α,β'-$C_5H_3N(NMe_2)NO_2$ (XXIII) (which is very smoothly obtained by nitration of α-$C_5H_4NNMe_2$), a *compd.*, apparently **XXIV** or **XXV**, yielding on cautious treatment with alkalies or, better, with NH_3 a *base* (XXVI) with the compn. of a β'-nitro-*N*-methyl-α-pyridone methylimide, which can also be prepd. by direct nitration of *N*-methyl-α-pyridone methylimide. **XXVI** dissolves in alkalies (but not in NH_4OH) with intense orange color; the solid **XXVI** itself and its aq. solns. are also intensely yellow, properties best explained by the tautomeric *p*-quinoid structure **XXVII**. Boiling H_2O decomps. **XXVI** in 2 ways: chiefly into the original **XI** and MeOH and to a lesser extent into β'-nitro-*N*-methyl-α-pyridone and $MeNH_2$. *β-Nitro-α-methylaminopyridine* (XII) (14 g. from 15 g. **X** and MeI at 120°), golden yellow, m. 63–4°, b_{740} 262–2.5°, easily volatile as such and with steam and Et_2O vapors, forms deeply colored aq. solns. which stain the skin, sol. without color in dil. mineral acids, the solns. becoming yellow on diln., has a strong odor somewhat resembling that of CHI_3. *α-[Methylnitramino]pyridine* (13.4 g. from 10.8 g. α-C_5H_4NNHMe in cold H_2SO_4 with HNO_3), m. 30–1°, insol. in alkalies, easily sol. in dil. mineral acids. *β'-Nitro-α-[nitrosomethylamino]pyridine* (XIV) (4 g. from 3.85 g. **XI** with $NaNO_2$ in cold 10% H_2SO_4), faintly yellowish, m. 112–3°, insol. in dil. mineral


(XXIV)


(XXV)


(XXVII)

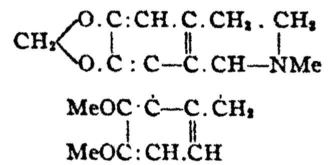
β-Nitro isomer (XV) (2.5 g. from 3.85 g. **XII**), yellow, m. 102–3°. *β-Bromo-β'-nitro-α-methylaminopyridine* (XVI) (1.1 g. from 1.65 g. **XI** in 10% H_2SO_4 with Br-NaBr), yellowish green, m. 163–4°, insol. in dil. mineral acids. *β',β-Isomer* (XVII) (1.4 g. from 1.54 g. **XII**), intensely yellow, m. 149–50°. *β-Nitro-α-[methylnitramino]-pyridine* (XXI) (1.1 g. from 1.5 g. **XII** and HNO_3 in cold H_2SO_4), light yellow, m. turbid, clear 105°, insol. in alkalies and dil. mineral acids. *β,β'-Dinitro-α-methylaminopyridine* (XX) (0.25 g. from 0.35 g. **XXI** in H_2SO_4 at room temp.), yellow, m. 147–8°, insol. in alkalies and dil. mineral acids. **XXIV** (19.8 g. from 15 g. **XI** and MeI at 125°),

m. 225° (decompn.). **XXVI** (4 2 g. from 9 g. **XXIV** with NH_4OH), light yellow, m. 149.5–50.5°. *β'-Nitro-α-[methylacetamido]pyridine* (3 g. from 3 g. **XI** and Ac_2O on the H_2O bath), m. 99°, insol. in cold dil. acids and alkalies but completely sapond. by boiling 0.5 min. with 0.5% HCl or NaOH; **XII** is not acetylated under the same conditions. C. A. R.

Some reactions of bromo derivatives of α-aminopyridine. A. E. Chichibabin and A. V. Kirsanov. *Ber.* **61B**, 1236–44(1928); cf. preceding abstr.—The object of this work was to det. whether in the methylation of halogen derivs. of α-$C_5H_4NNH_2$ (I) and subsequent nitration the same anomalies occur as had been found in the NO_2 derivs. of I. On heating α,β,β'-$C_5H_2N(NH_2)Br_2$ (II) with MeI, the reaction follows the same course as with I itself *β,β-dibromo-N-methyl-α-pyridone imide* (III) being the chief product and only a small quantity of α,β,β'-$C_5H_2N(NHMe)Br_2$ (IV) being formed. IV was identified by its prepn. from the Na deriv. of II with Me_2SO_4 and from α-C_5H_4NNHMe (V) with Br, α,β'-$C_5H_3N(NHMe)Br$ (VI) being obtained as an intermediate product in the latter reaction. With HNO_2 IV yields a stable NO deriv. while III gives *β,β'-dibromo-N-methyl-α-pyridone* (VII). On nitration in cold concd. H_2SO_4, II, III and IV yield mono-NO_2 derivs., VIII, IX and X, resp., with the NO_2 group on the amino (or imido) N atom. VIII in aq alkalies with Me_2SO_4 gives IX, which, like *N*-methyl-α-pyridone nitrimide and its NO_2 derivs., evolves N_2O with hot alkalies and forms VII. In the nitration of II in H_2SO_4 *there is a partial replacement of the β'-Br atom by* NO_2, with formation of α,β',β-$C_5H_2N(NH_2)(NO_2)Br$ (XI), as had already been observed. With the preformed nitramino derivs no such replacement of the Br atom has been noted, but there is a partial removal of the NO_2 group from the amino N atom with regeneration of the original II or IV. The HNO_2 resulting from the reduction of the HNO_3 also gives in the cold some of the NO deriv. of IV. Furthermore, the $NHNO_2$ or $NMeNO_2$ group is partially replaced by OH with formation of α,β,β'-$C_5H_2N(OH)Br_2$ (XII). When IX is heated with concd. H_2SO_4 the Me group does not migrate but either the NO_2 group is split off with regeneration of III or the $=NNO_2$ group is replaced by O, with formation of VII. Provisionally, it may be assumed that migration of the Me group is caused by the entrance of the NO_2 group into the C_5H_5N nucleus or by NO_2 groups already present. The reactions of derivs. of II with H_2SO_4 are not smooth, however; the odor of Br can always be detected, the product becomes dark and large quantities of non-crystallizable substances are formed. *HI salt* of III (35 g. from 25.2 g II and MeI on the H_2O bath in a sealed tube), greenish needles with 0.5 H_2O, begins to darken 200°, m. 218 9° (decompn.). Free III, best prepd. by decompg. the HI salt with NH_4OH and extg. repeatedly with C_6H_6, light yellow, m. 99–100°, cannot be extd. from AcOH with Et_2O, melts under hot H_2O, dissolves readily in dil. acids, is very sensitive to the peroxides present in old Et_2O. *β,β'-Dibromo-α-methylaminopyridine* (IV) (yield, 0.4 g. in the above prepn. of III. HI, 2 g. from 11.2 g. II with $NaNH_2$ in Et_2O and Me_2SO_4, or 3.5 g from 2.6 g. V and 10.7 cc. of a soln. of 10 cc Br in 50 cc. KBr), m. 56.5–7°, b_8 137–8°, is volatile with steam and has a peculiar pleasant smell. *β'-Bromo-α-methylaminopyridine* (VI) (1 g. from 2 6 g. V with 5 35 cc. Br-KBr (10 cc. Br in 50 cc. KBr)), m. 70–1°, sol. in dil. mineral acids. *NO deriv.* of IV (1 g. from 1.33 g. IV in 4% H_2SO_4 at 0° with $NaNO_2$), m. 56–7°, smells faintly of nitrosamines, insol in alkalies or dil. acids. *β,β'-Dibromo-α-nitraminopyridine* (VIII) (7.7 g. from 12 6 g. II), yellow, darkens 121°, m. 123° (decompn.), easily sol. in alkalies, NH_4OH and alkali carbonates. *β,β'-Dibromo-N-methyl-α-pyridone nitrimide* (IX) (4 7 g. from 4.7 g III), darkens about 180°, m 186–7° (decompn.), insol. in dil mineral acids and in alkalies, very unstable toward hot alkalies, giving N_2O and VII, m. 182°, insol. in alkalies or dil. mineral acids. C. A. R.

Alkaloids of Corydalis cava. XII. Synthesis of *d*-bulbocapnine methyl ether. Ernst Späth and Otto Hromatka. Univ. Wien. *Ber.* **61B**, 1334–42(1928); cf. *C. A.* **22**, 1781.—The structure of bulbocapnine (I) had been established except for the positions of the HO and MeO groups and this gap has now been filled in by the synthesis of *d*-bulbocapnine Me ether (II). The most promising way to the synthesis of all aporphine derivs. seemed to be the conversion of 1-[*o*-nitrobenzyl]isoquinoline derivs. (III) through the methochloride into derivs. of 1-[*o*-aminobenzyl]-*N*-methyltetrahydroisoquinoline, diazotization of the latter and transformation with Cu powder by the Pschorr method into phenanthrenes of the desired structure. The prepn. of the III often presents great difficulties. It has proved relatively easy, to be sure, in 2 cases (papaverine, 1-veratrylhydrohydrastinine) where direct nitration of compds. already contg. the isoquinoline ring has introduced the NO_2 group into the 2-position, but with other III treatment with HNO_3 results either in nitration at an undesired position or in the formation of an inseparable mixt. of isomers. In spite of Pictet

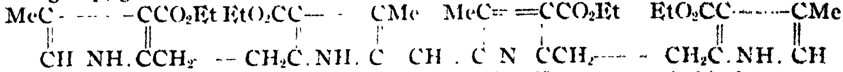
and Kay's inability to synthesize apomorphine by Bischler and Napieralski's method, starting from an acid amide already contg. a NO_2 group, S. and H. prepd., for the synthesis of II, *[2-nitrohomoveratroyl]homopiperonylamide* (IV), from 2,3,4-$O_2N(MeO)_2$-$C_6H_2CH_2COCl$ (V) (made from the acid and $SOCl_2$) and homopiperonylamine in C_6H_6 with NaOH. The IV, treated with P_2O_5 60–70 min. (not 5-15 min as is usual) gave almost 34% of the *dihydroisoquinoline deriv* (VI). One of the essentials for the success of the reaction seems to be the use of a relatively small quantity of substance and of a large quantity of solvent (in a trial expt. with 0.1 g. IV in 20 cc. PhMe the yield was 60%). VI MeCl with Sn and alc. HCl gives 66% of the oily *amino-N-methyltetrahydroisoquinoline deriv.* (VII), converted by diazotization and subsequent treatment with Cu powder and reduction with Zn dust and concd. HCl into II. Bases of the type of dilaudanosine, phenol bases and other impurities are of course also formed. The purification of the II presented great difficulties but was effected by fractional distn. in a high vacuum. Resolution of the product with *l*-tartaric acid yielded a product identical in m. p., rotation and MeO content with natural II, thus establishing its structure as being



V, m. 54–6°. IV (yield, 94.6%), m. 158° (all m. ps. in evacuated tubes). VI, m. 167.5–8.0°, sol. in cold dil. HCl and repptd. by alkalies; *HCl salt*, m. 217–8° (blackening); *methiodide*, light yellow, m. 192 3° (decompn.); *methochloride*, light yellow lacquer. II, m. 128–9°, $[\alpha]_D^{20}$ 259.5° ($CHCl_3$). *dl*-II, prepd. by methylating natural I with CH_2N_2 and racemizing the resulting *d*-II essentially according to Gadamer and Kuntze, m. 135.5–6 0°; *picrate*, m. 213–4° (decompn.). C. A. R.

Determination of the active hydrogen in hemin, some derivatives and pyrrolenes. III. H. Fischer and Paul Rothemund. Techn Hochschule München. *Ber.* **61B**, 1268–76(1928); cf. *C. A.* **22**, 1784.—In the 1st paper F. and Postowsky reported active H detns., by the Zerevitinov method, on a series of simple pyrrolenes, dipyrrylmethenes, hemin and bile pigment derivs. The results with hemin were consistent but the drawing of definite conclusions concerning the other substances was postponed until it should have become possible to use larger quantities for the detns. Shortly afterward, Kuhn, Braun, Seyffert and Furter (*C. A.* **21**, 2702) described a dihydrohemin, obtained by catalytic hydrogenation of hemin, characterized by the presence of 5 active H atoms, whereas in hemin they found, in agreement with F. and P., only 3. In the meantime, F. had obtained varying values (3–5 active H atoms) for hemin, and as considerable doubt has been cast, recently, on the general applicability of the Z. method, F. and R. have again taken up a study of it, considering all possible sources of error, especially the blanks. Z. recommends that detns. be made only when the blank is negative, and claims that by proper preliminary treatment of the C_5H_5N the blank can be brought down to zero, but even then a single opening of the vessel often results in a great increase in the blank, so that the requirement of a negative blank is not practicable. In their present work, F. and R made no detns. with the blank exceeding 4. Under these conditions the high values for hemin reported in the 2nd paper were not obtained, the values obtained in 7 expts. being 2.08–3.46; some of the prepns. used in the earlier work now gave abnormally low results (1.38–2.26), so that long standing of the substances may have some effect on the results. Furthermore, the values are comparable only when in the analyses the time intervals are kept the same within very narrow limits and when in reading the gas vol. Z.'s directions are followed exactly, *i. e.*, the minimum gas formation is taken as the basis for the calcn. Although working under N does not overcome these difficulties, all the detns. were made in N. Complete soln. of the substance is important; hemin without C_5H_5N gives no gas. The formation of a ppt. when the Grignard soln. is added may be another source of error; the quantity of gas evolved often depends on the way the mixt. is shaken. In all cases the mixts. were shaken vigorously for 1 min. but with the porphyrins the reaction was certainly not yet complete for the porphyrin spectrum could still be detected regularly along with the phyllin spectrum. Bis-[2,4-dimethyl-3-carbethoxypyrryl]methene gave 1–1.5 active H atoms, its HBr salt 2.6–2.97 (theoretical, 2). [2-Bromo-3-carbethoxy-4-methylpyrryl]-[2',4'-dimethyl-3'-carbethoxypyrryl]methene also gave a high value (1.49;

calcd., 1). The aldazine of 2,4-dicarbethoxy-3-methyl-5-formylpyrrole and its Cu complex gave about the same values (2.07–2.43, 2.53–3.01, resp.), although theoretically the former contains 2, the latter 0–1 active H atoms. These results indicate that besides the NH groups in the pyrrole derivs. the methine groups also react with the Grignard reagent. If this is true the Z. method appears fundamentally unreliable for porphyrins and hemins, which contain 4 methine groups. [2-Methyl-3-carbethoxy-4-hydroxypyrryl][2′,4′-dimethyl-3′-carbethoxypyrryl]methene, with two NH and one CH group, gave 2.06 active H atoms. The more complicated methene



with three NH and one CH group, gave only 2.6 active H atoms, probably because a good part of the substance crystd. out. Hemin di-Me ester gave 0.96, tetramethylhematoporphyrin-Fe salt 0.89 active H atom. Widely varying results were obtained for uroporphyrin ester (2.07–7.79), isouroporphyrin ester (4.02–6.31), octaethylporphin (1.32) and acetonepyrrole (2.76–3.76). Etioxanthoporphinogen gave 4.50, its mono-K salt 4.39–4.53, di-K salt 3.76–3.90, octaethylxanthoporphinogen 4.23, tetramethyltetrapropylxanthoporphinogen (I) (dried at 50° and contg. $2H_2O$) 9.69, tetra-Me coproporphyrinxanthoporphinogen 6.75. No exptl. evidence could be obtained that the H_2O content is responsible for the abnormally high value given by **I**; in PhN:NPh to which had been added a little H_2O the active H found was not materially greater than that corresponding to the added H_2O. F. and R. conclude that unavoidable catalysts greatly influence the gas evolution in the Z method and complex pyrrole derivs. can of themselves exert such influences; moreover, the methine groups in them also react. The cautious position adopted in the 1st paper as to the interpretation of the results of the Z. method when applied to hemin was and remains entirely justified.

C. A. R.

Simultaneous oxidation and reduction and molecular transpositions. Transposition of α-keto alcohols and the mechanism of alcoholic fermentation (Favorskii) **16.** Plant coloring matters. VII. Lycopin (Karrer, Widmer) **11D.** Odor and constitution among the mustard oils. IV. Effect of fluorine substitution (Dyson) **11A.** The x-ray diagrams of liquids as an expression of the shape and arrangement of the molecules in the liquid state (Katz) **2.** Evidence of the anisotropy of the carbon atom (Lonsdale) **2.** Alkali metal nitrates and nitrosulfonic acid (Brit. pat. 283,771) **18.**

Adams, Roger, and Johnson, John R.: **Elementary Laboratory Experiments in Organic Chemistry.** New York: The Macmillan Co. 304 pp. $1.90.

Gomberg, Moses: **Radicals in Chemistry, Past and Present.** New York City: Columbia Univ. Press. Chandler Lecture. 23 pp. $0.50. Reviewed in *J. Chem. Education* **5,** 1204(1928).

Houben, J., and Fischer, Walter: **Das Anthracen und die Anthrachinone.** Leipzig: Georg Thieme Verlag. 890 pp. M 85, bound M 90.

Hydrocarbon. Alwin Mittasch, Walter Frankenberger and Fritz Winkler (to I. G. Farbenind. A.-G.). Can. 283,411, Sept 18, 1928. Liquid hydrocarbons of low boiling point are produced by acting on gases comprising olefins in the presence of CH_4 at 200–900° and under elevated pressure with at least one of the following catalysts: noble metal, Cu, alkali metal compds., oxygen acids of P, B, Sb and metal salts thereof, in particular alkali metal salts.

Hydrocarbons. Wilhelm Gessmann and Eduardo W. Shalders. Can. 282,392, Aug. 14, 1928. Easily boiling hydrocarbons are produced by passing a mixt. of unsatd. hydrocarbons and a gas contg. carbon oxide and H without applying heat and at normal pressure over a catalyzer subjected to chemically active light rays. The catalyst consists of a mixt. of pure powd. electrolytic Cu, W and pumice stone powder treated with a dil. caustic alk. lye and quickly dried.

Oxygenated organic compounds from oxides of carbon by reduction. I. G. Farbenind. A.-G. Ger. 462,837, June 28, 1928. In the catalytic prepn. of oxygenated org. compds., *e. g.*, methanol, by reduction of oxides of carbon by H or hydrocarbons or both at high temps. and pressures, the mixt. of gases entering the reaction is completely freed from catalyst poisons, not only sulfur compds. especially org. ones but also from volatile iron compds., preferably by using active carbon.

Organic arsenic compounds. August Albert. Ger. 463,313, July 5, 1928.

Addn. to Ger. 459,649. Arsenic compds. contg. a CO group, not in a ring, are condensed with compds. contg. several hydrazine groups. In examples *p*-acetophenonearsonic acid or 1-acetophenone-3-hydroxy-4-arsenobenzene is condensed with carbohydrazide, malonyl hydrazide, oxalyl hydrazide, thiocarbohydrazide, triaminoguanidine dinitrate or diaminoguanidine dihydrobromide.

Arsenic compounds. LEOPOLD CASSELLA & Co. Ger. 452,065, Nov. 5, 1927. 4-Hydroxy-3-amino-1-phenylarsinoxide (400 g.) is mixed with 4 l. of H_2O and 400 cc. of 10 *N* NaOH and 250 cc. Ac_2O is added. The acetyl product is filtered off by suction. It can be recrystd. from a NaOAc soln. The product is sol. in hot water and cold caustic alkalies and alkali carbonates, difficultly sol. in cold weak mineral acids, and easily sol. in alc. and weak AcOH. Ten g. 4-hydroxy-3-aminophenyl-1-arsonic acid is dissolved in 200 cc. 10 *N* HCl and 40 cc. H_2O and mixed with 2 g. KI dissolved in 20 cc. of H_2O. SO_2 is bubbled through the soln. for several hrs. and the ppt. filtered off and dissolved in 60 cc. of H_2O. The soln. is cooled, neutralized with NH_3 and satd. with NaCl. The arsinoxide is filtered off and washed with salt water. It is then brought into soln. with 150 cc. H_2O and 25 cc. 10 *N* NaOH and shaken well with 5 cc. BzCl while being warmed on a water bath. Ten cc. BzCl is further added in 2 portions and warmed a short time. The crude product ppts. It is redissolved in 0.5 *N* NaOH, filtered and pptd. by addition of HCl. The resulting product is almost insol. in H_2O, and sol. in hot soda soln., cold NaOH, alc. and boiling AcOH. It is not diazotizable. Fifteen g 3-hydroxy-4-aminophenyl-1-arsonic acid is dissolved in 60 cc. H_2O and 300 cc. 10 *N* HCl and mixed with 3 g. KI in 30 cc. H_2O. A thick paste results, through which SO_2 is bubbled for several hrs. The resulting ppt. is filtered off, dissolved in 75 cc. H_2O, filtered through animal charcoal and pptd. with strong HCl in excess The ppt. is filtered off, levigated with 100 cc. H_2O and dissolved with 50 cc. NaOH (40° Bé.). The soln is treated with BzCl and finished in the same manner as in the second example.

Arseno compounds. AUGUST ALBERT. Ger. 463,577, July 12, 1928. Condensation products from mixed aliphatic-aromatic carbonyl arsenic compds. with amino compds. (except $(NH_2)_2$ and its derivs.) are reduced in H_2O soln. or suspension with $Na_2S_2O_4$. Examples: *p*-Acetophenonearsonic acid and *p*-aminoacetophenone, arseno compd. unchanged at 270°; *p*-acetophenonearsonic acid and anthranilic acid, arseno compd. unchanged at 270°; *p*-aminoacetophenonearsonic acid and urea, arseno compd. unchanged at 280°; *p*-benzaldehydearsonic acid and aminoantipyrine, arseno compd. decomps. about 200°; 1-hydroxy-2-acetophenone-4-arsonic acid and *p*-phenetidine, arseno compd., sinters and darkens 220°; *p*-acetophenonearsonic acid and *o*-aminobenzaldehyde, arseno compd. decomps. 225°; *p*-acetophenonearsonic acid and glycocoll, arseno compd. darkens about 250° without melting; *m*-nitrobenzaldehydearsonic acid and benzylhydroxylamine-HCl, arseno compd. decomp. 120°; *p*-benzaldehydearsinoxide and NH_2OH-HCl, arseno compd. infusible at 280°. The C=N bond is not reduced in these compds.

Preparation of organic phosphorus compounds. LEOPOLD CASSELLA & Co. Ger. 452,064, Nov. 5, 1927. Tetrahydronaphthalene 100 parts is mixed with 100 parts PCl_3 and 100 parts of $AlCl_3$ is carefully introduced. After the reaction is completed the reaction mixt. is heated for 3 hrs. on a water bath. The thick oily mass is introduced into ice water, the ppt. filtered off, taken up in weak soda or NH_3 soln. and again pptd. with HCl. The resulting product is insol. in H_2O and weak mineral acids, easily sol. in alkalies or alkali carbonates, MeOH, EtOH, acetone, C_6H_6, and warm $CHCl_3$ and difficultly sol. in ether. A similar process can be carried out by reaction of 100 parts of decahydronaphthalene, 160 parts PCl_3 and 100 parts $AlCl_3$ or 50 parts tetrahydronaphthalene, 35 parts PCl_3 and 10 parts $AlCl_3$ and warming the latter for 40 hrs. on the water bath.

Halogenated organic compounds. I. G. FARBENIND. A.-G. Brit. 283,877, Jan. 18, 1927. The mixt. of products obtained in the halogenation of org. compds. (such as the mixt. of methyl, methylene and H chlorides obtained by passing MeCl and Cl through a chamber heated to 360–380°) is treated with an alc. such as MeOH under conditions to effect a reaction between the alc. and the H halide present. Heating, increased pressure or catalysts may be used to facilitate the reaction.

Chlorides of aromatic *o*-hydroxycarboxylic acids. ERIC B. HIGGINS (one-half to British Synthetics, Ltd.). U. S. 1,684,273, Sept. 11. Chlorides of aromatic *o*-hydroxycarboxylic acids are produced by causing thionyl chloride to react (preferably in theoretical proportions) upon a salt of the acid in question such as the mono-Na salt of 2,3-hydroxynaphthoic acid (suitably by grinding the reagents together in a ball mill).

Chlorides of aromatic oxamic acids. I. G. FARBENIND. A.-G. (Josef Haller,

inventor). Ger. 463,140, July 5, 1928. Hydrochlorides of aromatic primary amines, *e. g.*, $PhNH_2.HCl$, α- and β-$C_{10}H_7NH_2.HCl$, or *o*-$MeC_6H_4NH_2.HCl$, are stirred at ordinary temp. with *oxalyl chloride* to obtain phenyloxamyl chloride, m. 82.5°, almost theoretical yield, α-naphthyloxamyl chloride, yellowish needles, m. 86°, β-naphthyloxamyl chloride, colorless needles from C_6H_6, m. 114–5° (decompn.), or *o*-tolyloxamyl chloride, yellow needles, m. 89–90°.

Decomposing cyclic compounds with hydrogen and catalysts. I. G. FARBENIND. A.-G. Brit. 283,600, July 12, 1926. A mixt. of carbazole vapor with H is passed at 350° over a catalyst prepd. by reducing in H at 400° a mixt. of $Al(OH)_3$ and Fe oxide; the products include C_6H_6, NH_3 and $PhNH_2$. Other catalysts for use in this reaction may be prepd. similarly from mixts. of (*a*) oxides of Zn, Cr, Cu and Fe; (*b*) oxides of Mg and Fe; (*c*) oxides of Zn, Fe and Al; or, (*d*) oxides of Zn, Fe and Ti. Cresol vapor with H is passed at 450° over a catalyst prepd. by reducing in H at 350° a mixt. of oxide of Fe and Al; the products include C_6H_6 and toluene. Other phenols or phenolic mixts. such as tar fractions may be similarly treated, preferably by using mixed catalysts contg. a component having both dehydrogenating and dehydrating properties such as Fe_2O_3 or oxides of Mo or U. A light oil is obtained from low-temp. tar by passing a mixt. of its vapor with H at 450° over a catalyst prepd. by reducing in H at 350° a mixt. of Fe oxide, MgO and NH_4 vanadate. Centrifuged crude $C_{10}H_8$ vapor with H is passed at 450° over a catalyst prepd. by reducing in H at 400° a mixt. of Fe oxide and NH_4 molybdate; the product comprises C_6H_6 and other liquid hydrocarbons, and, by varying the conditions, there may be obtained chiefly toluene, *o*-xylene and other homologs of C_6H_6. Numerous other details and modifications of processes for effecting similar reactions are described.

Preparation of carbocyclic and heterocyclic compounds. I. G. FARBENIND. A.-G. (Erwin Hoffa, inventor). Ger. 464,087, July 26, 1928 FSO_3H (I) is used instead of $ClSO_3H$, or $H_2S_2O_7$ in ring closing. In some cases, *e. g.*, in the prepn. of thioindigo dyes the oxidizing action of I is used to oxidize the hydroxythionaphthenes, resulting primarily from the arylthioglycolic acids, to thioindigos. In examples *m*-chlorophenylthioglycolic acid with I gives chlorohydroxythionaphthene; 1-chloronaphthalene-2-thioglycolic acid (II) gives at 15–20° the corresponding hydroxythionaphthene. This can be oxidized to the corresponding thioindigo or condensed with isatin and its derivs. to indirubin dyes. Ring closure and oxidation of II with I gives a blue, reddish tinged, dye of good fastness. 4-Aminoanthraquinone-1-anthranilic acid is similarly converted to 4-aminoanthraquinone-1,2-acridone, *o*-benzoylbenzoic acid to anthraquinone, α-naphthoylbenzoic acid to benzanthraquinone and *o*-methylhydrocinnamic acid to 4-methyl-1-keto-2,3-dihydroindene.

Unilaterally acylated diamines. SOC. ANON. POUR L'IND. CHIM. À BÂLE. Ger. 464,142, July 26, 1928. Alkylenediamines, of which one N is a tertiary amino N, are made to react with acid halides or anhydrides of higher fatty acids. Alkylenediamines are made to react with higher fatty acids or their esters, using more than one mol. of amine per mol. of fatty acid. In examples linoleic acid is caused to react with asymm diethylenediamine; stearic acid with ethylenediamine hydrate (I) gives distearylethylenediamine, basic smelling crystals from AcMe, m. 103°, and monostearylethylenediamine, sol. in H_2O to a turbid, alk. liquid. Mono- and dioleylethylenediamine from oleic acid (II) and I. Propylenediamine and olive oil give a mixt. of stearyl-, palmityl- and oleylethylenediamines. ω-Amino-*N*-ethylpiperidine and II give oleylpiperidyl-*N*-ethylamine. Asymm. dimethylethylenediamine and stearyl chloride in C_6H_6 give stearyldimethylethylenediamine, insol. in H_2O, sol in org. solvents, crystals from H_2O + AcMe, m. 71°. Asymm. diethylethylenediamine and II heated to 200–20° give oleyldiethylethylenediamine, thick oil, insol. in H_2O, sol. in org. solvents.

Diarylamines and their derivatives. HANS BUCHERER. Ger. 451,980, Nov. 1, 1927. *p*-$C_6H_4(NH_2)_2$ or its derivatives are treated with sulfurous acid esters of phenol or the α-naphthol series in the presence or absence of an excess of sulfite. A condensation product results. *E. g.*, (1) Resorcinol, *p*-$C_6H_4(NH_2)_2$, 11 g. each, and 150 cc. of 30% bisulfite soln. are heated together. Upon cooling. 3-hydroxy-4-aminodiphenylaminesulfonic acid crystallizes out. (2) 1,4-$H_2NC_{10}H_6SO_3Na$ (25 g.) is heated with 11 g. *p*-$C_6H_4(NH_2)_2$ and 150 g. of 30% bisulfite soln. Upon cooling the reaction product crystallizes out. (3) 1,4-$H_2NC_{10}H_6SO_3H$ (16 g.), heated for 24 hrs. with 10.5 g. *p*-aminodimethylanilinethiosulfonic acid and 60 g. of bisulfite soln. yields a thiazine. (4) 1,4-$H_2NC_{10}H_6SO_3H$ (16 g.) with 13 g. of 1,2,4-$H_2N(HO)C_{10}H_5SO_3H$ gives a product that is probably an oxazine. Similarly α- or β-naphthol sulfurous acid esters can be condensed with *p*-aminodimethylanilinethiosulfonic acid to form thiazines or oxazines.

Aminoguanidines or their salts. SCHERING-KAHLBAUM A.-G. Ger. 463,576,

July 12, 1928. Diamines, *e. g.*, $H_2N(CH_2)_4NH_2$ or $H_2N(CH_2)_5NH_2$, and hydrazines, *e. g.*, $(NH_2)_2$ or CH_3NHNH_2 or their hydrates give aminoguanidines or their salts on the addition of alkylisothiourea salts, *e. g.*, methyl- or ethylisothiourea sulfate. The reaction takes place with all diamines, hydrazines and their alkyl derivs.

Double compounds of sulfur dioxide with aldehydes or ketones. RUDOLF BAYER CHEMISCHE FABRIK. Ger. 464,010, July 26, 1928. SO_2 in liquid or solid state is caused to react with aldehydes or ketones or liquid SO_2 (I) is allowed to run into the liquid aldehydes or ketones. In examples the double compds. are obtained from I and acetone, benzaldehyde and a mixt. of acetone oil and tolualdehyde.

Sulfonated compounds. CHEMISCHE FABRIK MILCH A.-G. (to Oranienburger chemische Fabrik A.-G.). Brit. 283,864, Jan. 17, 1927. Acids of low mol. wt. such as acetic, propionic, butyric or lactic acid are condensed with aromatic or hydroaromatic hydrocarbons or their derivs. by use of dehydrating and strongly sulfonating substances such as halosulfonic acids, to produce sulfo acids. Polynuclear compds. such as $C_{10}H_8$, $C_{14}H_{10}$ and their derivs. formed by alkylation, chlorination, hydroxylation or hydrogenation are suitable for the aromatic components. The products may be used as emulsifying agents for solvents which are insol. in water or difficultly sol. and for mineral oils and fatty substances, and may be used alone or in various mixts. as pasting, cleaning, lathering, wetting or fatting agents in the color, paper, textile and leather industries and in laundry, dyeing, bleaching, carbonization, mercerizing and finishing operations and as prewetting and cleaning agents for sensitive wools, silks and feathers. Several examples are given.

Lower aliphatic acids. BRITISH CELANESE, LTD., H. DREYFUS AND C. I. HANEY. Brit. 283,702, Nov. 30, 1926. Acetic, propionic and other lower aliphatic acids are extd. from aq. solns. by a mixt. of a solvent for the acid (such as ether, $CHCl_3$ or acetone oil) and a hydrocarbon such as C_6H_6 or gasoline. Numerous details of procedure are given.

Dinaphthyldicarboxylic acids. RICHARD HERZ and WERNER ZERWECK (to Grasselli Dyestuff Corp.). U. S. 1,684,272, Sept. 11. In making 1,1'-dinaphthyl-8,8'-dicarboxylic acid or other dinaphthyldicarboxylic acid of the general formula $(C_{10}X_6)_2$-$(COOH)_2$, in which X stands for H atoms one or more of which may be replaced by a univalent substituent, 1,8-aminonaphthoic acid or other suitable aminonaphthoic acid compd. is diazotized and the diazo compd. is treated with an ammoniacal soln. of Cu_2O, and the dinaphthyldicarboxylic acid produced is isolated by acidifying the soln. formed. Several examples are given.

Sulfonic acids. G. S. PETROV. Russ. 508, Sept. 15, 1924. Sulfonic acids obtained according to pat. 428 are taken up with water and EtOH. MeOH or AcMe is added to the aq. layer to sep. the hydrocarbons present.

Anhydrous salts of lower fatty acids. HOLZVERKOHLUNGS-INDUSTRIE A.-G. Ger. 463,829, July 19, 1928. Anhydrous esters, *e. g.*, methyl acetate, are treated with anhydrous hydroxides, *e. g.*, NaOH in solvents, *e. g.*, alcohols.

Bile acid salts of cephaeline alkyl ethers. CHEMISCHE FABRIK VORM. SANDOZ. Brit. 283,533, Jan. 12, 1927. Bile acid salts of cephaeline alkyl ethers are prepd. by combining the alkaloids with the bile acids in mol. proportions or by double decompn. of suitable salts of the bases and acids. Examples are given of the combination of emetine with cholic or desoxycholic acid and of cephaeline ethyl ether with cholic acid. Other bile acids also may be used.

Esters of glycolic acid. DR. ALEXANDER WACKER GES. FÜR ELEKTROCHEM. IND. G. m. b. H. Ger. 463,139, July 5, 1928. Alkali chloroacetates are heated in the presence of a small amount of water or other liquid of suitable b. p. and the resulting glycolic acid is esterified with alc. and mineral acid. In an example chloroacetic acid (I) is neutralized with Na_2CO_3 (II) and heated under reflux below 150°. The resulting mass is esterified with BuOH and H_2SO_4. In another example, I, II and BuOH are heated 2 hrs. at 140°, then esterified by using H_2SO_4. Ethyl glycolate can be made similarly. The esters are useful as *plasticizers* for *lacquers*.

Anthraquinone derivative. I. G. FARBENIND. A.-G. Ger. 451,907, Nov. 1, 1927. One part benzylideneanthrone is introduced into a mixt. of 1 part of NaCl and 4 parts of $AlCl_3$ at 100–110°. The mixt. is heated for a short time and boiled with dil. HCl. A resin forms which can be crystd. from pyridine. One part benzylideneanthrone and 1 part anhydrous $AlCl_3$ are heated to 120–150° until the benzylideneanthrone is completely used up. The inorg. portion of the mixt. is washed out with HCl and the reaction product recrystallized from pyridine. $SbCl_5$ can be substituted for $AlCl_3$.

Pyridine derivatives. SCHERING-KAHLBAUM A.-G. (FORMERLY CHEMISCHE FABRIK AUF ACTIEN, VORM. E. SCHERING). Brit. 283,576, Jan. 14, 1927. 2-Amino-5-iodopyri-

dines are made by reaction of alkali on the chloroiodo compds. of 2-aminopyridines obtainable as described in Brit. 264,508 (*C. A.* **22**, 91). Examples are given for the production of 5-iodo-2-amino-, 5-iodo-2-ethylamino-, 5-iodo-2-isopropylamino-, 5-iodo-2-isoamylamino- and 5-iodo-2-diethylaminopyridine and 5-iodo-2-amino-6-methyl-3-ethylpyridine by the action of an excess of NaOH soln. on the corresponding chloroiodo compds.

Quinoline derivatives. SCHERING-KAHLBAUM A.-G. (FORMERLY CHEMISCHE FABRIK AUF ACTIEN, VORM. E. SCHERING) Brit. 283,577, Jan. 14, 1927. 4-Alkylquinolines are made by condensing aniline or its derivs. with alkyl β-haloethyl ketones (which may be obtained as described in Brit. 282,412 (*C. A.* **22**, 3668)) in acid, neutral or alk. soln. and with or without use of an oxidizing agent such as $PhNO_2$ or arsenic acid. 4-Methylquinoline (lepidine) is made from aniline and methyl β-chloroethyl ketone; 6-methoxylepidine from *p*-anisidine; 8-methoxylepidine from *o*-anisidine; 6-ethoxylepidine from *p*-phenetidine; 6-nitrolepidine from *p*-nitroaniline; lepidine-8-carboxylic acid from anthranilic acid ester (sapon. is effected during the condensation); and 4-ethylquinoline from aniline and ethyl β-chloroethyl ketone; condensation may be effected in the presence of $PhNO_2$ and concd. HCl or 40% H_2SO_4, or, in one instance, in the presence of NaOH. Usually a mixt. of bases is first produced and the desired product is isolated as the picrate except with the carboxylic acid.

Prevention of polymerization of vinyl compounds. KENNETH G. BLAIKIE (to The Canadian Electro Products Co., Ltd.). Can. 282,860, Aug. 28, 1928. Polymerization of vinyl compds. and their reaction with aldehydes in mixts. of same is prevented by adding S to the vinyl compds.

Guanidino alcohols. SCHERING-KAHLBAUM AKT.-GES. (Herbert Schotte, inventor). Ger. 462,995, June 28, 1928. Cf. Ger. 455,682 and Erlenmeyer, *Ber.* **14**, 868(1881). Salts of amino alcs. react with cyanamide in EtOH soln. at 100–110° in autoclaves to give guanidino alcohols. In examples methylaminoethanol-HBr gives methylguanidinoethanol-HBr, m. 101–3°, picrate m. 166°. Free base sol. in H_2O, EtOH, insol. in Et_2O, AcOEt, and $CHCl_3$. Ethylaminoethanol-HCl gives ethylguanidinoethanol-HCl, picrate, m. 158°, very sol. in H_2O as are the Me and isoamyl derivs. Isoamyl deriv., sol. in H_2O and EtOH, picrate, m. 117–8°. Benzyl deriv., sol. in H_2O and EtOH, picrate oily. *o*-Acetylmethylaminoethanol-HCl (from chlorohydrin acetate and methylamine) gives *o*-acetylmethylguanidinoethanol-HCl, sol. in OH-contg. solvents, insol. in Et_2O and $CHCl_3$. Aminoethanol sulfate gives guanylcholamine sulfate, hygroscopic crystals, hydrobromide, hygroscopic, picrate, difficultly sol. in H_2O, picrolonate, very difficultly sol.

Benzanthrones. BRITISH ALIZARINE CO., LTD., W. H. DAWSON, C. W. SOUTAR AND J. ANDERSON. Brit. 284,035, Nov. 3, 1926. Anthraquinones or the corresponding anthranols are condensed with the reaction mixt. obtained by treating glycerol with a S-contg. chlorinating agent such as S_2Cl_2 or SCl_2, thionyl chloride or sulfuryl chloride. Some of the products contain S and yield compds. of the violanthrone type by fusion with alc. KOH. Several examples are given.

Chlorinated ethylenes. ALEXANDER WACKER GES. FÜR ELEKTROCHEM. IND. G. m. b. H. (Walter Körner and Alfred Suchy, inventors). Ger. 464,320, Aug. 2, 1928. Cf. Ger. 222,622, 263,457 and 274,782. Chlorinated ethylenes are obtained from chlorinated ethanes, *e. g.*, trichloroethylene (I) from tetrachloroethane and perchloroethylene from pentachloroethane, by passage over strongly heated, strongly adsorbent carbon, preferably bone charcoal. Better yields (95% boiling below 100°) of I are obtained with adsorbent C at 300–310° than with $BaCl_2$ on pumice at 380–400° (70% below 100°) or at 300° (even lower yield) or with ThO_2 at 360–390° (68%). Non-adsorbent C is not active. Cf. Nicodemus (*C. A.* **5**, 2814).

Erythrene. B. V. BUIZOV. Russ. 1102, Sept. 15, 1928. The products of a pyrogenous decompn. or distn. of crude mineral oil (vapors, etc.), free from tars and liquids are subjected to the action of a red-hot wire of Pt or a similar metal.

Erythrene. B. V. BUIZOV. Russ. 1101, Sept. 15, 1924. A mixt. of C_2H_4 or EtOH with $(CH_2OH)_2$ or its halogen esters is subjected to the action of compds. or mixts which cause a catalytic splitting off of water or hydrogen halides.

Formamide. I. G. FARBENINDUSTRIE A.-G. (Rudolf Wietzel, inventor). Ger. 463,843, July 19, 1928. Addition to 460,613. Formamide is obtained by reaction of NH_3 with alkyl formates, *e. g.*, methyl formate for a short time in the presence of a catalyst, *e. g.*, Al_2O_3 at 150–200°. Cf. *C. A.* **22**, 1367.

Nitriles. I. G. FARBENIND. A.-G. (Otto Nicodemus, inventor). Ger. 463,123, July 5, 1928. Nitriles, *e. g.*, acetonitrile or diethylacetonitrile, are prepd. by passing the vapors of alcohols, monohydric or polyhydric, primary, sec. or tert., with HCN

over highly porous catalysts, *e. g.*, active C, silica gel, Al_2O_3, or ThO_2. Cf. *C. A.* 21, 2478.

Thioureas. SILESIA VEREIN CHEM. FABRIKEN (Walter Flemming and Hans Klein, inventors). Ger. 464,319, Aug. 2, 1928. Cf. Rathke, *Ber.* **12**, 774. Thioureas are prepd. from mustard oils and diarylguanidines at elevated temp. below the decompn. pt. of the thioureas, in indifferent solvents. In examples there are prepd.: *N,N'*-di-*o*-tolyl-*N"*-phenylthiocarbamidoguanidine, 93% yield, m. 179–180°, from di-*o*-tolylguanidine and phenyl mustard oil in boiling C_6H_6; *N,N'*-diphenyl-*N"*-*o*-tolylthiocarbamidoguanidine, 75% yield, m. 118–9°, from diphenylguanidine and *o*-tolyl mustard oil in boiling C_6H_6 (using xylene causes decompn.); and *N,N'*-diphenyl-*N"*-methylthiocarbamidoguanidine, 53% yield, m. 165–6°, from diphenylguanidine and methyl mustard oil.

Acetic acid. CHEMISCHE FABRIK AUF ACTIEN (VORM. E. SCHERING). Brit. 284,143, April 7, 1927. Ca acetate is added to a paste of gypsum in HOAc as obtained by reaction of H_2SO_4 on Ca acetate while avoiding an excess of H_2SO_4. After the process is initiated, the materials may be added continuously. The paste may be drawn off by an overflow to a vacuum distn. app. provided with a device for withdrawing the $CaSO_4$ which has been freed from HOAc.

Acetic acid, etc. BRITISH CELANESE, LTD., H. DREYFUS AND W. BADER. Brit. 283,989, July 20, 1926. HOAc or MeOAc is obtained by heating MeOH with CO in the presence of an inorg. acid or an inorg. acid "contg. an org. group" such as a sulfonic acid or of a corresponding acid salt The process may be carried out at atm. pressure but higher pressures which may be up to 300 atm. or more are preferred, with temps. of 300–400°. As catalysts there may be used the various phosphoric acids, boric, arsenic and phosphomolybdic acids and acid Al phosphate, either in liquid or solid state or distributed on a carrier such as coke or graphite. The process may be combined with a preliminary catalytic synthesis of MeOH and other starting materials such as Me formate may be used in effecting similar reactions instead of MeOH or MeOAc Numerous examples, modifications and details are given.

Acetic anhydride. C. RUZICKA. Brit. 283,781, May 27, 1927. Ac_2O is made by the action of SO_3 on "ordinary" or glacial HOAc. Partially converted mixts. may be used directly in *acetylating cellulose*.

Phthalamic acid. AUGUSTE CHESNAIS. Can. 282,407, Aug. 14, 1928. Phthalamic acid is prepd. by adding NH_3 water to phthalic anhydride, evapg. the excess of NH_3, washing with distd. H_2O and drying. Cf. *C. A.* **22**, 2034.

Benzobenzanthronecarboxylic acid. LEOPOLD CASSELLA & CO. Ger. 452,063, Nov. 5, 1927. Ten kg. 1,1'-dinaphthyl-8,8'-dicarboxylic acid is boiled under a reflux condenser with 200 kg. of AcOH and 20 kg. of anhyd. $ZnCl_2$ until the initial materials have gone into soln. The soln. is filtered, dild. with water and the benzobenzanthronecarboxylic acid seps. A suspension of 10 kg. of 1,1'-dinaphthyl-8,8'-dicarboxylic acid suspended in 48 kg. of 48% H_2SO_4 is treated with 230 kg. of H_2SO_4 (66° Bé.) below 60° until a test sample sepd. by water is wholly or almost wholly sol. in AcOH. The sepn. then proceeds as in the example above. The product can be purified by dissolving in alkali, filtering and pptg. with acid. Halogen or nitrogen substitution products can be made in the same manner by starting with the substituted product; *e. g.*, dibromodinaphthyldicarboxylic acid gives dibromobenzobenzanthronecarboxylic acid.

2-Phenylquinoline-4-carboxylic acid. R. VON WULFING. Brit. 283,822, Sept. 23, 1927. Isatin-bisulfite of Na or isatin and $NaHSO_3$ are dissolved in hot water, and NaOH and acetophenone are added.

Methanol synthesis. COMPAGNIE DE BETHUNE. Brit. 283,499, Jan. 11, 1927. In making MeOH by oxidizing CH_4 or from CO and H or in other exothermic reactions under pressure, water or other suitable liquid is mixed with the reaction gases and utilized to control the temp. of the reaction by the abstraction of heat for its vaporization. An app. is described.

Butyl chloride. ALEXANDER WACKER GES. FÜR ELEKTROCHEM. IND. G.m.b.H. (Georg. Basel and Felix Kaufler, inventors). Ger. 462,993, June 28, 1928; cf. *C. A.* 18, 1977. BuOH is heated in such an amount of concd. HCl that at least 10% HCl remains at the end of the reaction. The process may be continuous under pressure in Ag or Ag-plated vessels at temps. above 130° for 10–20 min.

Apparatus for subliming anthraquinone, naphthalene, camphor, etc. HERBERT G. STONE. U. S. 1,683,931, Sept. 11.

Perylene from 2,2'-dihydroxy-1,1'-dinaphthyl. COMPAGNIE NATIONALE DE MAT. COLORANTES PRODUITS CHIM. Ger. 462,894, June 28, 1928. β-Dinaphthol is heated

with $POCl_3$ and Zn dust and the resulting product distd. with or without the addn. of CaO at about 600° gives perylene. Yield 40–45%, m. 260°.

Recovering pure pyridine from pyridine base mixtures. FRITZ ARNDT and PAUL NACHTWEY. Ger. 451,956, Nov. 1, 1927. The mixt. is first concd. by fractionation and then treated with 6 *N* HCl until the basic odor disappears and then with 6 *N* $NaClO_4$ in somewhat larger quantity than the HCl. The pyridine perchlorate formed is filtered off and washed with 20% $HClO_4$ or satd. NH_4ClO_4 soln. and then dried at 110–120°. The resulting product is subjected to a stream of dry NH_3 while being cooled and decomposes into free pyridine and NH_4ClO_4. When there is still a small part of $C_5H_5NHClO_4$ left, the NH_3 stream is stopped and the mixt. heated to 100°, whereby the remaining perchlorate is decompd. The pyridine is distd. off under vacuum and freed from any water by drying over KOH.

Menthol. HANS JORDAN (to Chem. Fabrik auf Actien (vorm. E. Schering)). Can. 283,946, Sept. 4, 1928. Menthol and its isomers and homologs are produced by treating the condensation product of *m*-cresol and acetone at 180–190° in the presence of 0.1% Al 3-methyl-6-isopropylphenolate and about 1% of a Ni catalyst with H until 16 H atoms have entered into combination. Cf. *C. A.* **22**, 2952.

Recovery of pure phenol by the distillation of crude phenol. ZECHE MATHIAS STINNES. Ger. 451,958, Nov. 1, 1927. The crude phenol, preferably after a previous fractionation, is distd. with a small amount of free O or air with or without the addn. of a small quantity of an O carrier such as trinitrophenol or nitrobenzene or other carriers such as basic Zn chloride or $(BzO)_2$. The distn. is carried on under vacuum. The phenol distillate is then treated with SO_2 or H_2SO_3, washed with hot or cold water and again distd. if necessary

Lead tetraalkyl. H. W. DAUDT. Brit. 283,913, Jan. 20, 1927. Pb tetraalkyl is made in a single operation by reaction of Mg, an alkyl halide and a Pb salt, *e. g.*, a suspension of Pb chloride and Mg turnings in dry ether is treated with EtBr and the temp. gradually raised to 30–35° and later maintained at 35–39° for 12 hrs. If an alkyl chloride is used in the reaction, catalysts such as MeI and I may be required. Diluents such as gasoline, C_6H_6 or toluene may be added. Cf. *C. A.* **21**, 3907.

1,2,3,4-Tetrahydroanthraquinone. GEORG SCHROETER. Ger. 463,830, July 19, 1928. Anthracene in tetralin soln. is reduced to tetrahydroanthracene (I) with H_2 under pressure. Pure **I**, m. 103–4°, can be sepd from di- and octahydroanthracene through the picrate, m. 116°, insol. in EtOH, or by fractional distn. **I** is oxidized to 1,2,3,4-tetrahydroanthraquinone (II) by CrO_3 in HOAc soln. **II** remaining in the mother liquor is recovered by reduction to 1,2,3,4-tetrahydroanthrahydroquinone with Zn and NaOH, filtration and air oxidation.

Oxindole-3-propionic acid. CHEM. FABRIK AUF ACTIEN (VORM. E. SCHERING). Ger. 451,957, Nov 1, 1927. Mol. quantities of oxindolealdehyde and malonic acid are heated to 150–160° until the evolution of CO_2 and steam ceases. The melt is cooled and dissolved in *N* NaOH. The soln. is made acid with dil. HCl and the pptd. oxindole-3-acrylic acid filtered off. The ppt. is recrystd. several times from dil. hot alc. and boiled for some time with animal charcoal. The resulting yellowish red crystals are fairly readily sol. in alc. and AcOH, more difficulty sol. in ether and AcOEt and very slightly sol. in hot water. It decomposes at 212°. It is fairly sol. in alk. solns. and its NaOH soln. bleaches $KMnO_4$ immediately. The oxindole-3-acrylic acid is dissolved in *N* NaOH and reduced by means of an excess of Al amalgam. The oxindole-3-propionic acid obtained is recrystd. from hot water. It m. 208°, is sol. in alc., ether and glacial AcOH, less sol. in petroleum ether and hot water and nearly insol. in cold water. It crystallizes into yellow colored prisms.

11—BIOLOGICAL CHEMISTRY

PAUL E. HOWE

A—GENERAL

FRANK P. UNDERHILL

Oxidation of levulose in absence of oxygen. E. AUBEL AND L. GENEVOIS. *XII Int. Cong. Physiol.* 1926, 11-2.—In anaerobiosis, levulose reduces certain dyes, the rate of reduction of 10^{-3}–10^{-6}*N*-methylene-blue soln. being independent of the dye concn., but increasing with increased p_H value and levulose concn. B. C. A.

Taka-invertase. R. WEIDENAGEN. *Z. Ver. deut. Zuckerind.* **1928**, 125-34.—

Taka-diastase was found to be without action on melibiose, but to hydrolyze raffinose and sucrose at velocities in the ratio of 1:1.96. Conclusion: Taka-invertase is a fructo-invertase and is not assocd. with a melibiase as supposed by Leibowitz and Mechlinski (*C. A.* 20, 3173). The decompn. of raffinose was complete within 24 hrs., and even after 96 hrs. no carbohydrates other than melibiose and levulose could be detected. The optimum p_H value for taka-invertase is about 5.0. Evidence for and against the existence of gluco- and fructo-invertases is considered. B. C. A.

The chemical and physical composition of protoplasm. V. V. Lepeshkin. Univ. of Ill. *Science* 68, 45-8(1928).—The principal components of protoplasm are proteins and lipoids (fats, sterols and phosphatides). Carbohydrates and protein decompn. products may or may not be present, while small amts. of salts are always present. The proteins and lipoids are probably in chem. combination with each other but the compds. are so unstable that they can often be destroyed even by purely mech. forces. The selective permeability of living protoplasm, the very different permeability of the proteins and lipoids from dead protoplasm and the fact that death is caused by reagents that react either with proteins or with lipoids indicate that proteins and lipoids are combined with each other. Living protoplasm is in the hydrophilic colloid state as proved by the extreme ease with which it undergoes change in consistency. Ordinarily it is liquid but it readily becomes rigid in part or even in the whole mass. The protein-lipoid compds. form the dispersion medium of the colloid and for that reason anything that alters either the protein or the lipoid destroys the stability of the colloid and causes death. F. L. Browne

The stability of colloidal ferrous phosphate prepared with gelatin or blood serum. Mariano Messini. *Kolloid-Z.* 45, 322-5(1928).—Since intravenously or subcutaneously injected ferrous salts are changed to colloidal $Fe_3(PO_4)_2$, the stability of colloidal $Fe_3(PO_4)_2$ in the presence of gelatin or of blood serum was studied. The sols were made by mixing 0.3 *N* soln. of $FeSO_4$ contg. gelatin or serum with 0.3 *N* soln. of Na_3PO_4 also contg. gelatin or serum, and noting how long the sols remained stable. The stability increases with the content of protecting colloid until a max. is reached beyond which no further increase results. The stability is greater the more dil. the $Fe_3(PO_4)_2$. F. L. Browne

Kidney phosphatase and its activation. II. Holger Erdtman. Univ. Stockholm. *Z. physiol. Chem.* 177, 211-20(1928); cf. *C. A.* 22, 435.—The activator present in meat ext. which increases the activity of kidney phosphatase toward glycerophosphate evidently does not function merely as a protective substance. No difference in extent of activation is noted when the enzyme is given a preliminary treatment for 24 hrs. at p_H 8.8° and 30° with or without activator. The activator has a greater affinity for phosphate than for enzyme and the affinity of the enzyme for the activator-phosphate complex is negli ible. In the purified activator prepns., however, a small amt. of activator corresponds to a much greater amt. of liberated phosphate. It is not probable therefore that the activator diminishes an inhibition of enzyme by phosphate liberated during the reaction It seems more likely that the enzyme-activator complex is more resistant to inhibition by phosphate than is the enzyme itself and a sort of buffer effect is thus obtained. The activation of zymophosphate cleavage, on the other hand, was not so great as that of glycerophosphate cleavage, due to a small amt. of activator already present in the zymophosphate prepn. Purification of the activator obtained from meat ext. by Pb and Ba pptns. and recrystn. of the H_2SO_4 salt of the basic constituent yielded $MgSO_4$ which also had the properties of an activator. It is not certain, however, that the activating properties of the meat ext. reside entirely in the Mg ions present. III. *Ibid* 231-6.—The activation of kidney phosphatase by $MgSO_4$ is more or less specific. $CaSO_4$ and $BeSO_4$ gave no such activation, and $ZnSO_4$ showed a distinct inhibition in the same mol. concns. at which the activation by $MgSO_4$ was very marked. Purification of the enzyme may be effected in several ways. The filtered ext. after 7 days autolysis is more active than after 2 days autolysis, but less active than the fresh turbid ext. An ext. from the dried prepn. is considerably more active, and by $Al(OH)_3$ adsorption the activity is increased still further. Elution may be performed by NH_4OH or Na_2HPO_4, the latter giving a more active product but in lower yield. Kaolin also adsorbs the enzyme, but neither the adsorption nor the elution is sufficiently selective for purification purposes. The purest prepn., which was obtained by $Al(OH)_3$ adsorption and Na_2HPO_4 elution, gave a positive Millon reaction, negative or doubtful Molisch reaction, and indistinct biuret reaction. A. W. Dox

Variations in serum calcium. P. Mescltskii. Leningrad Medical Institute. *Z. ges. exptl. Med.* 55, 13-6(1927).—Ca was detd. in cats by Clark's method (*C. A.*

16, 941) except that 3% NH_4 oxalate was used. Starvation increased the blood Ca. Following kidney extirpation there was a rise in the first 24–48 hrs. followed by a sharp fall. $HgCl_2$ poisoning and splenectomy lowered the blood Ca. Normal values for cats were 14.69 for males and 14.57 mg. per 100-cc. blood for females. F. L. DUNN

The disintegration of potassium myronate by animal sulfatase. IX. Sulfatase. CARL NEUBURG AND JOACHIM WAGNER. Kaiser Wilhelm-Institut. *Z. ges. exptl. Med.* **56**, 334–43; cf. *C. A.* **21**, 923–4.—Potassium myronate was obtained from black mustard seeds (*Brassica nigra*) and mixed with liver, muscle and kidney tissue of horses and rabbits, and the amt. of sulfate formed detd. as $BaSO_4$. Only negligible amts. were found. F. L. DUNN

Adsorption therapy. H. BECHHOLD AND L. KEINER. Inst. Kolloidforschung zu [Fra]nkfort. *Z. ges. exptl. Med.* **56**, 543–61(1927).—A study of the effect of various adsorbing agents used singly and in combination and their effectiveness for bacteria, toxins and enzymes. F. L. DUNN

Odor and constitution among the mustard oils. IV. Effect of fluorine substitution. G. MALCOLM DYSON. *Perfumery Essential Oil Record* **19**, 341–2(1928); cf. *C. A.* **22**, 3174.—It has already been shown that the entrance of Cl, Br and I into the nucleus of aromatic mustard oils is attended with a modification in the odor which is dependent on the position taken up by the entering halogen atom. In general, the effect of a halogen substituent in the para position is to give a mustard oil with a sweet anise odor—the sweetness of the odor increasing with increase of wt. of the halogen atom—becoming a max. with *p*-iodophenyl mustard oil. A series of aromatic mustard oils has now been prepd. contg. F in place of the halogens previously used, in order that a systematic comparison of the odors of these series might be made. Examn. of the chem. reactivity of the mustard oils substituted by F, Cl, Br and I in the para position has revealed that as far as the NCS group is concerned there is little to choose between the 3 last compds., but that the F compd. occupies a position intermediate between that of the others and of the unsubstituted phenyl mustard oil. Furthermore, a connection can be traced between this variation in chem. activity and the periodic motion associated with the C-S electron pairs which, it may be added, depends in turn upon the atomic vols. of the substituent groups F, Cl, Br and I. Thus, the larger the atomic vol. occupied by the halogen, the greater the alteration of the orbits of the C-S electron pairs, and consequently the greater enhancement of the reactivity of the NCS group. Arguing from these premises it seems more than probable that the odor of the fluoro compds., depending as it does on the intramol. vibrations, will be parallel to the chem. reactivity, and that the osmic frequencies will be intermediate between those of the simple unsubstituted phenyl mustard oil and its corresponding *p*-chloro, -bromo and -iodo derivs. This conclusion was found justified in the case of the para compds. Of the *m*-fluoro mustard oils examd., three (of which 2 contained the Me group) have very pronounced "true" mustard oil odors. It should be noted also in this connection that 3- and 4-fluorophenyl mustard oils exert a pronounced vesicant action on the skin, which is quite appreciable in the cases of the other corresponding halogen compds. So far, the attempts to prep. the 2-fluoroaniline required for the prepn. of 2-fluorophenyl mustard oil have been unsuccessful. 3-Fluoro-4-nitroaniline was, however, prepd., and converted by the action of $CSCl_2$ upon its HCl-salt into 3-fluoro-4-nitrophenyl mustard oil. In common with the other mustard oils contg. the NO_2 group this compd. is without any characteristic odor. These expts. serve to show that for purposes of practical perfumery the aromatic fluoro mustard oils are unsuitable, and that attention must be concd., as far as blending is concerned, upon the analogous Cl and Br compds. W. O. E.

The resorption of copper and ferrocyanide ions by coagulated proteins. BYRON M. HENDRIX. Univ. Texas. *J. Biol. Chem.* **78**, 655–60(1928).—Coagulated egg albumin adsorbs Cu^{++} and $Fe(CN)_6^{----}$ from soln. The amt. of Cu^{++} absorbed increases with the p_H up to p_H 6.9 while the amt. of $Fe(CN)_6^{----}$ absorbed decreases with increasing p_H. ARTHUR GROLLMAN

Edward Stafford Edie (1879–1927). H. E. R. *Biochem. J.* **22**, 617–8(1928).—Obituary notice. BENJAMIN HARROW

Ernst Henry Starling (1866–1927). C. L. E. *Biochem. J.* **22**, 618–20(1928).—Obituary notice. BENJAMIN HARROW

The reducing power of cysteine. E. C. KENDALL AND D. F. LOEWEN. Mayo Foundation, Rochester, Minn. *Biochem. J.* **22**, 649–68(1928).—A reply to Dixon and Tunnicliffe (*C. A.* **22**, 437). Cysteine cannot reduce indigo carmine and it cannot oxidize reduced indigo carmine or reduced indigo in the absence of an activating agent, which is produced through the action of O_2 or Na disulfide on indigo carmine. Fe

cannot activate the —SH or —SS grouping, but it can influence the velocity of reaction between O_2 and indigo carmine. The activating agent appears to be an unstable O_2 or S addn. product of indigo carmine and its action involves the activation of the S atom. BENJAMIN HARROW

Mechanism of oxidation-reduction potential. I. The oxidation-reduction potential of cysteine and cystine. E. C. KENDALL AND D. F. LOEWEN. Mayo Foundation, Rochester, Minn. *Biochem. J.* **22,** 669–82(1928).—The authors take issue with Dixon's hypothesis (*C. A.* **21,** 2596) of a "steady state" depending on a kinetic equil. between the dissocn. of H_2 from cysteine and diffusion of H_2 from the surface of the metal electrode. The drift in the reduction potential with a Pt electrode has been shown to be due to traces of O_2, or oxidizing substances, adsorbed on the surface of the metal. When cysteine is oxidized it does not form cystine at once but an intermediate compd. BENJAMIN HARROW

The reduction potential of cysteine. D. C. HARRISON AND J. H. QUASTEL. Biochem. Lab., Cambridge. *Biochem J.* **22,** 683–8(1928).—Traces of metals which bring about a catalytic effect with cysteine do not bring about the increase in neg. reduction potential which is demanded on Dixon's hypothesis (*C. A.* **21,** 2596). BENJAMIN HARROW

Some properties of the dehydrogenating enzymes of bacteria. J. H. QUASTEL AND W. R. WOOLDRIDGE. Biochem. Lab., Cambridge. *Biochem. J.* **22,** 689–702(1928).—The *B. coli* enzyme which activates lactic acid as a H donator adsorbs compounds of the type —CO—COH*— or —CHOH—COH*, where H* is mobile, the compd. having acidic properties. The enzyme which activates succinic acid adsorbs compds. of the type —C—CH—COOH or —C—CH_2—COOH. The reduction of methylene blue by glucose in the presence of bacteria is independent of the intermediate production of lactic acid. The effect of toluene can be explained on the "active center hypothesis" (*C. A.* **21,** 2715). A "soluble" prepn. of the lactic acid enzyme has the same adsorbing power on a particular type of compd. as has the lactic acid enzyme of *B. coli.* B. H.

Inhibitory effect of sugars on hemolysis by sodium taurocholate. ERIC PONDER AND J. F. YEAGER. New York University. *Biochem. J.* **22,** 703–10(1928).—The inhibitory action of the sugars is a double one both in saponin–sugar–cell systems (*A*) and taurocholate–sugar–cell systems (*B*). In (*A*) the principal effect is on the cells themselves rather than on the activity of the lysin. In (*B*) the effect of the lysin may be very much greater than that of the cells themselves. The greatest depression of the activity of the lysin in taurochlolate–sugar–cell systems occurs when the lysin is in those concns. in which it is most unstable. BENJAMIN HARROW

Artefacts as a guide to the chemistry of the cell. C. E. WALKER. Univ. Liverpool. *Proc. Roy. Soc.* (London) **B103,** 397–403(1928).—During fixation, the position and arrangement of the lipins in relation to the nucleus are probably controlled by some chem. change in the latter. When yellow P is dissolved in either Me myristate or Me laurate, and this lipin is then added as an emulsion to certain colloidal mixts., which are then kept at a temp. of 30°, microscopic examn. after fixation and treatment with OsO_4 shows that a large proportion of the lipins has become distributed over the globules in approx. 2 hrs., and that most of the fatty acids have become satd. or oxidized in 24 hrs. JOSEPH S. HEPBURN

Influence of the rays of the sun on the basal metabolism of man. JAROSLAV MĚLKA. Komensky Univ., Bratislava. *Bratislav. Lekárske Listy* **6,** 50–61(1926).—A 14 to 47% increase in O_2 consumption was found in persons exposed to the rays of the sun during the noon hours of July. WILLIAM J. HUSA

The amount of cholesterol in the blood serum of middle-aged persons. JAROSLAV MĚLKA. Komensky Univ., Bratislava. *Bratislav. Lekárske Listy* **6,** 296–9(1927).—Of 50 healthy, middle-aged persons, 27 were found to have hypercholesterolemia; the cholesterol content in these cases varied from 190 to 307 mg. in 100 cc. of blood serum. WILLIAM J. HUSA

The permeability of the surface between blood and cerebrospinal fluid—a problem. ERNST WIECHMANN. *Krankheitsforsch.* **5,** 150–66(1927).—If the surface between the blood and the cerebrospinal fluid is regarded as a dead membrane, there should be set up a membrane equil. A survey of the literature shows that the ion concns. in the blood and liquor do not fulfil the conditions of the Donnan equation. P. Y. J.

The action of neutral salts in enzymic processes. The effect of bromides on salivary amylase. KSHITISH CHANDRA SEN. Allahabad Univ. *J. Indian Chem. Soc.* **5,** 245–9(1928).—The amyloclastic action of salivary amylase in the presence of a phosphate buffer is studied. The range of p_H from 5.8 to 6.8 was investigated and NaCl added to activate the enzyme. The optimum p_H for amyloclastic action lies about

6.7. The addn. of NaCl shows a normal accelerating effect and higher concns. of phosphate buffer do not assist. Low concns. of KBr increase the chromic period but higher concns. of KBr (0.10 m. per l.) decrease this time which is in agreement with Thomas (*C. A.* **11**, 2336). With NaBr only an increase in the chromic period is noted. In studying the sacharogenic effect of KBr and NaBr with no buffer it is found that in the concns. studied (up to 0.2 m.) a depression of the activity of the enzyme is noted. D. H. POWERS

Some effects of x-radiation on blood. W. V. MAYNEORD AND A. PINEY. London Cancer Hospital. *Brit. J. Radiology, New Series* **1**, 257–82(1928).—Rabbits were irradiated from below with x-rays from a Coolidge tube run at 90 kv.-peak, 2.9 ma., the target being 24.5 cm. from the animal. The radiation had a half value layer of 0.295 mm. Al and an av. intensity of 19 R. per min. Large doses (7920 R.) caused extreme lymphocytopenia, persisting until death, neutrophilia, which decreased toward death, and monocytosis, which appeared late and lasted until death. No change in red corpuscles was found. Death took place in about 3 weeks. Smaller doses (500 R.) reduced the lymphocytes and increased the neutrophiles, but both of these returned to normal some weeks after irradiation. Monocytosis was slight or lacking. Effects of divided doses were more intense and prolonged than those of a single dose. E. H. QUIMBY

Transformation of uric acid to urea by sulfo-chromic oxidation. (MLLE.) J. SCHWANDER AND H. CORDEBARD. *Bull. soc. chim. biol.* **10**, 920–31(1928).—The hydrolysis of urea by H_2SO_4 was greater as the acid was nearer to the theoretical amt. for the transformation of the urea. The degree of hydrolysis also varied with the temp. and with the time. The addn. of $K_2Cr_2O_7$ to the H_2SO_4 solns. of urea changed none of these general conclusions, but promoted the hydrolysis by lessening the time and lowering the temp. With the sulfo-chromic mixt. at 50 to 60% of the H_2SO_4 present, the transformation of uric acid to urea on the boiling water bath (98°) was 95 to 96% and to NH_3 3.0 to 3.5%. L. W. RIGGS

Experiments with collodion tubes substituting blood vessels. I. Formation of endothelium by the monocytes of the blood. TIVADAR HUZELLA. *Magyar Orvosi Arch.* **29**, 101–13(1928); cf. *C. A.* **22**, 2586.—By inserting small collodion tubes into the blood vessels of animals, the formation of endothelium could be followed along the wall of the artificial vessel. The most essential wall of the closed blood vessel system is a fine membrane which coagulates between the blood plasma and the tissue fluid. L. W. RIGGS

Effect of Röntgen rays on the blood and blood-forming organs of white rats. E. WOENCKHAUS. *Arch. exptl. Path. Pharmakol* **131**, 335–56(1928).—In young, growing rats (during the first 4 weeks of life) a severe anemia may be produced by small doses of x-rays. Keeping the rats on a rickets-producing diet does not intensify the effects of irradiation. Protection of the spleen and liver from the x-rays prevents the development of anemia. G. H. S.

Effect of short wave-length rays on the fluorescence of proteins and their split products. PAUL WELS. Univ. Greifswald. *Arch. ges. Physiol.* (Pflüger's) **219**, 738–52 (1928).—Serum euglobulin shows a bluish fluorescence when exposed through a dark filter to ultra-violet light, and when irradiated with unfiltered rays from a Hg lamp the fluorescence is increased. The effect is quantitatively related to strength of dosage. After quartz light treatment, with fluorescence the euglobulin soln. becomes turbid. Protein-split products behave in a similar fashion. The fluorescent effects are in large part detd. by the presence of O. G. H. S.

Influence of light environment on the organic constitution of normal rabbits with especial reference to the action of neon light. WADE H. BROWN AND MARION HOWARD. Rockefeller Inst. for Med. Research. *J. Exptl. Med.* **48**, 567–89(1928); cf. *C. A.* **22**, 3691.—The light environment produces an effect on the phys. constitution of rabbits which was comparable to the effects produced on the functional activity of the same animals. C. J. WEST

Measurement of the electrokinetic potential on protein (BRIGGS) 2.

Chemistry in Medicine. Edited by Julius Stieglitz. Published by the Chemical Foundation, Inc. 780 pp. Two vols. in one. $2.

Prevention of glucolytic processes. WALTER SCHOELLER and MAX GEHRKE. (to Schering-Kahlbaum A.-G.). Can. 281,842, July 17, 1928. The glucolytic action of living cells is stopped by the action of an org. F compd., as FCH_2CO_2H, $FC_6H_4CO_2H$, $FC_6H_4SO_3H$ or their salts.

B—METHODS AND APPARATUS

STANLEY R. BENEDICT

Determination of urobilinogen in urine and feces. A. ADLER. *Deut. Arch. klin. Med.* **154,** 238–48(1927).—Isolation of urobilinogen is necessary for its accurate detn. A suitable extn. app. has been constructed. B. C. A.

Determination of urobilinogen in feces and urine by the new extraction method. A. ADLER AND M. BRESSEL. *Deut. Arch. klin. Med.* **155,** 326–41(1927).—Ehrlich's urobilinogen reaction is quant. only under definite conditions. In the chloroform ext. of urine or feces the conversion of the chromogen into urobilin takes place much more slowly than in urine or after addn. of alc., being maximal when 1 cc. of Ehrlich's reagent and 2 cc. of abs. alc. are added to 2 cc. of chloroform ext. Normally, 1–3 mg. per day appear in the urine; in urine and feces together, 100 mg. B. C. A.

The imperfect working of hematoxylin as a nuclear stain. G. C. VAN WALSEM. *Nederland. Tijdschr. Geneeskunde* **72,** I, 1808–12(1928).—Hematoxylin fails to stain differentially the single minute structural elements of the nucleus. W. obtains a satisfactory differential staining by adding an alk. soln. of Br_2 to the stain. R. B.

The benzidine and guaiacum reactions in urine with special consideration of the role of uric acid in these reactions. OSKAR WELTMANN AND WALTER WASCHATA. III. Mediz. Universitätsklinik, Wien. *Wiener klin. Wochschr.* **41,** 1041–3(1928).—A discussion. D. B. DILL

A simple nitrite reaction in urine. LUDWIG POPPER AND SIEGFRIED WEISS. I. Med. Abteilung des Allg. Krankenhauses in Wien. *Wiener klin. Wochschr.* **41,** 1081–2(1928); cf. *C. A.* **7,** 1069.—Benzidine in AcOH soln. added to urine gives an orange-red color in the presence of nitrites. D. B. DILL

Determination of carbon monoxide in blood. W. M. M. PILAAR. Tech. Hoogeschool Delft. *Chem. Weekblad* **25,** 509–13(1928).—The Cohen-Tervaert method (*C. A.* **19,** 1877) for detg. CO in blood is based on the liberation of CO by vacuum and addn. of $K_3Fe(CN)_6$, reaction of the gas in the presence of air with I_2O_5 at 150°, absorption of the liberated I in KI soln. and titration with $Na_2S_2O_3$. It has the disadvantage of requiring 10 cc. of blood, the app. must be swept out with 1–2 l. of purified air, loss of I occurs through absorption by rubber stoppers and connections, and the concn. of KI recommended is insufficient. All of these objections are overcome by a modification of the app. and technic, whereby a micro method has been developed requiring only 1 cc. of blood. Rubber stoppers and connections are replaced by ground glass joints, the I_2O_5 is heated in an air bath instead of an oil bath, and the I absorbed by the KI is titrated from a micro buret directly in the absorption chamber without transfer to another vessel. Only 150–300 cc. of air are required to sweep out the app. and the time consumed is 25–40 min. instead of 1–1.5 hrs. The app. is described in detail and certain precautions to be observed are pointed out. The I_2O_5 is rendered more efficient by mixing with glass wool and is given a preliminary heating at 200–300°. With very pure I_2O_5 correction is made for a small negative blank. For details of operation the original paper should be consulted. A. W. DOX

A method for measuring the hydrogen-ion concentration in very small volumes. S. S. GIRGOLAV AND I. I. SHUKOV. Med. Akad. and Univ. Leningrad. *Z. ges. exptl. Med.* **56,** 710–3(1927).—A modification of the Schade method (cf. *C. A.* **16,** 120). F. L. DUNN

Sugar reduction agents. ENGELB. SCHLECHT. *Pharm. Ztg.* **73,** 1006–7 (1928).—The claims of Brandrup (*Apoth. Ztg.* **43,** 373; *C. A.* **22,** 1825) respecting the influence of arbutin-contg. urine in application of sugar tests are questioned. W. O. E.

Use of fermentation saccharometer. KARL EBERT. Fähr-Vegesack. *Pharm. Ztg.* **73,** 1007(1928).—Attention is directed to the accuracy of this app. in testing for sugar in urine, especially in questionable cases where the Nylander or Fehling tests have been negative. W. O. E.

Note on the use of fermentation saccharometers. KARL EBERT. *Pharm. Ztg.* **73,** 1099(1928); cf. preceding abstract.—There is substantial agreement with E.'s criticisms among co-workers in this field. W. O. E.

The estimation of aluminum in animal tissues. V. C. MYERS, J. W. MULL AND D. B. MORRISON. State Univ. of Iowa. *J. Biol. Chem.* **78,** 595–604(1928).—A colorimetric method is described for estg. the minute quantities of Al found in body tissues. The method consists in digestion with a mixt. of H_2SO_4 and $HClO_4$; pptn. of the Al and some Fe by NH_4OH; removal of the Fe; and the development of a color reaction upon the Al with the NH_4 salt of aurin tricarboxylic acid. By using reagents of the

very highest purity and with proper precautions, the results by the method are accurate within 10%. ARTHUR GROLLMAN

... histidine and arginine. IV. The preparation of histidine. ... New Haven ...

from coagulated blood cells ... dine pptd. as its Ag compd. at p_H 7.4. It is then pptd. with ... and crystd. at its isoelec. pt. The product is purified by crystn. of the dihydrochloride. A yield of 4 to 5% of the dry blood cells is obtained. ARTHUR GROLLMAN

A micro-method for the determination of potassium as iodoplatinate. ALFRED SHOHL AND HELEN B. BENNETT. Yale Univ. *J. Biol. Chem.* **78**, 643-51(1928).—A procedure is described for detg. 0.1 mg. of K with an accuracy of ±4%. The deproteinized material is ashed and the K pptd. as the chloroplatinate. The latter is then converted to the iodoplatinate by means of KI in acid soln. and detd. colorimetrically against known standards. ARTHUR GROLLMAN

The fractionation of serum proteins by means of ammonium sulfate. ANNA MUSCHEL. Hospital for Joint Diseases, N. Y. *J. Biol. Chem.* **78**, 715-8(1928).—The method usually employed was modified by aerating the soln. at 60-70° to remove the free NH_3 of the albumin soln. and by adding 0.2 cc of a 30% H_2O_2 soln. to hasten oxidation in the digestion mixt. ARTHUR GROLLMAN

Gasometric determination of hemoglobin by the carbon monoxide capacity method. D. D. VAN SLYKE AND ALMA HILLER. Rockefeller Institute. *J. Biol. Chem.* **78**, 807-19(1928).—Hemoglobin is detd. by measuring the vol. of CO combined with it, using the manometric gas app. of Van Slyke and Neill. The results agree perfectly with those derived from O capacity values. ARTHUR GROLLMAN

A modified method for the determination of hippuric acid and free benzoic acid in the urine of cattle. F. J. WARTH AND N. C. D. GUPTA. Imperial Dept. of Agriculture in India, Bangalore. *Biochem. J.* **22**, 621-7(1928).—The novelty in the method consists in estg. the liberated benzoic acid with the aid of partition coeffs. B. H.

The morphology of lipoids. PAUL KIMMELSTIEL *Krankheitsforsch.* **5**, 403-18 (1928).—The following method is recommended for the identification of intra- and extracellular lipoids in tissues previously extd. with acetone. The section is washed with water and treated for 5 min. with an anhyd satd. soln. of ponceau red in acetone; by this treatment the entire section is intensely colored. It is then dipped for a moment into a 55-60% aq. soln. of acetone; this soln. dissolves the dye more rapidly from the non-lipoid tissues and permits differentiation by color. It is important that the concn of acetone in this soln. be carefully regulated; too high a proportion of acetone removes all the dye from the tissue; too little causes ppts. which later interfere with the examn of the section. The section is now washed with distd. water; nuclear staining and all subsequent treatment follow the usual procedure for staining with ponceau or sudan III. The section as a whole is rose red; the fat an intense dark red. Illustrations are given to show the combined lipoid in the atheromatous aorta, in the brain, etc. P. Y. JACKSON

Uric acid determination in blood according to Benedict. S. BUCHTEJEV. *Moskovskij med. zhurnal* **7**, 5-7(1927); *Ber. ges. Physiol. exptl. Pharmakol.* **44**, 667-8.—A *micromodification* of Benedict's method. To 3.4 cc. distd. water in a test tube add 0.2 cc. blood, 0.2 cc. Na_2WO_4, then dropwise 0.2 cc. 0.66 N H_2SO_4. Mix thoroughly, allow to stand 30-45 min. and centrifuge. To 1 cc. of the centrifuged soln., add 0.4 cc. 5% NaCNO and 0.1 cc. Benedict reagent, shake vigorously and heat 1.5 min. on the water bath, cool and det. in Autenrieth's colorimeter. The results agree with macro-detns MARY JACOBSEN

Estimation of sulfur in blood and in organic products. A. LESURE AND A. DUNEZ *Bull. soc. chim. biol.* **10**, 879-90(1928).—In detg. S by the volumetric benzidine method of Pohorecka-Lelesz (cf. *C. A.* **21**, 2145), an error may be introduced by the use of acetone contg. S as an impurity. With care to use S-free acetone this method of detg. S in body fluids and org. material is recommended. L. W. RIGGS

Quantitative estimation of indican in the blood serum and urine as a kidney functioning test in surgery. MASAO MUTO. *Tôhoku J. Exptl. Med.* **11**, 57-77(1928).—Thirty-one references to the literature are given. The quant. estn. of indican in blood and urine by the method of Jolles-Rosenberg, especially in combination with ureteral catherization, may be performed with sufficient accuracy for testing the kidney functioning in surgical cases. At the same time results by this method should be checked by other methods of testing kidney functioning. L. W. RIGGS

Studies on lipochromes. II. The identification of carotin, xanthophyll and asso-

ciated lipoids in tissues. Charles L. Connor. Harvard. *Am. J. Path.* **4**, 235–44 (1928); cf. *C. A.* **22**, 2763.—Carotin and xanthophyll, the two common lipochromes, do not stain by any of the fat stains ordinarily employed to differentiate them. When associated with a lipoid which does stain, this lipoid takes a blue stain with Nile blue sulfate, and may therefore be cholesterol, cholesterol ester, soap, fatty acid or lecithin, since it is anisotropic, and carotin and xanthophyll are not. When a pigment is present in tissues associated with a substance which takes a specific stain for fat, this pigment may be assumed to be a lipochrome, but this is not invariably so. Yellow pigment which tends to coalesce when treated with weak alc. KOH and formalin, or which crystallizes in the tissue after such treatment, is probably lipochrome. Pigment which disappears or loses its color after treatment with a strong soln. of $FeCl_3$ (or other oxidizing agent), if not continued too long, may be assumed to be lipochrome. Pigment which is sol. in the usual fat solvents (ether, petroleum ether, $CHCl_3$, etc.) is probably lipochrome, but this treatment, in order to be effective and of differential value, must be prolonged and used after dehydration of the tissue with alc. or acetone. Nile blue sulfate differentiates only neutral fats from all other lipoids, neutral fat staining red, and all other lipoids, which stain, blue. Lecithin, which takes a somewhat lighter stain than the other blue-staining lipoids, may possibly be differentiated from them but careful timing of the staining process is necessary. **IV. The nature of the pigments in certain organs.** *Ibid* 293–308.—A new technic was developed which consisted of the following. The organs were dissolved and saponified in alc. KOH, dehydrated, and extd. with petroleum ether. In some cases the resultant pigment was identified by spectroscopic examination. The fat stains used were Scharlach R and an aq. soln. of Nile blue sulfate. The precursor of melanin was identified by the Dopa reaction with 3-4 dihydroxyphenylalanine. Basic fuchsin was used to stain hemofuscin and it also stained lipoids and the cytoplasmic granules of tissue mast cells. Mallory's iron reaction with ammonium sulfhydrate, followed by $K_3Fe(CN)_6$ and acetic acid, was used. The results of study of the types of pigment found in the various tissues were as follows. *Skin*—melanin and lipochrome; also, in hemochromatosis; hemofuscin and hemosiderin. *Fat*—lipochrome. *Heart, intestinal muscle, seminal vesicles, testicles, prostate*—hemofuscin and hemosiderin. Increased in old age, brown atrophy and hemochromatosis. *Liver* and *spleen*—hemofuscin and hemosiderin besides bile pigment. Increased in old age, brown atrophy and hemochromatosis. *Adrenal cortex*—lipochrome. *Adrenal medulla*—probably melanin. *Corpus luteum*—lipochrome. F. B. Seibert

Simple and quick method for the determination of organic combined iodine in body fluids. Paul Kuhn and Arnold Loeser. Univ. Köln. *Arch. exptl. Path. Pharm.* **131**, 262–7(1928).—The org. materials are destroyed by Na and saltpeter, and after the addn. of water and dil. H_2SO_4 the I is detd. by shaking with $CHCl_3$ and adding $Na_2S_2O_3$. G. H. S.

Determination of bismuth in urine. George Ciogolea. Univ. of Bucharest. *Bul. soc. chim. Roumania* **10**, 55–60(1928).—A study of the Cuny and Poirot method (cf. *C. A.* **18**, 208) for its application to urine. This method, following directions given by C., gives result accurate to $\pm 3\%$. P. Thomasset

Apparatus for treatment of "blood stream infections" with ultra-violet radiations. Lester A. Edblom and Emmet K. Knott. U. S. 1,683,877, Sept. 11.

C—BACTERIOLOGY

CHARLES B. MORREY

Photo-biological action of light. J. Risler, A. Philibert and J. Courtier. *Compt. rend.* **186**, 1152–4(1928).—No bacteriophage is obtained by the addn. of the filtrate of a culture of organisms, previously killed by the action of light in the presence of fluorescent dyes, to a similar living culture. *B. tuberculosis* is partly destroyed by the light of the Ne lamp in the presence of many dyes (especially those of the pinacyanol class). The great bactericidal action of the light produced by the elec. volatilization of Al wire is described. B. C. A.

Changes produced in meat extracts by the bacterium Staphylococcus aureus. Application of the alcohol titration methods. F. W. Foreman and G. S. Smith. *Dept. Sci. Ind. Research, Food Investigations* **1928**; *Special Rept.* No. **31**, 97 pp.—The ext. used was that of ox heart made with plain tap water and concd. to 1/4 or 1/16 of its original vol. The growth of the bacteria in this medium at 37° was compared over extended periods with the variation in the proportion of amino acids, volatile bases, volatile and non-volatile acids, etc., as detd. by the alc. titration method (cf. Foreman, *C. A.*

22, 2182). The organisms exhibited various periods of growth, each of which was characterized by a particular chem. change. In the 1st period the rate of growth reached a max. on the 4th day and resulted in the production 1st of volatile bases, then of volatile and non-volatile acid radicals, and finally of non-volatile acid radicals alone. A second max. occurred on the 28th day, when non-volatile acid radicals were converted into the equiv. amt. of volatile acid radicals During a third period of growth the no. of organisms gradually diminished, while the decline in the non-volatile acid radicals continued practically to zero with production of CO_2, the volatile acid radicals remaining approx. const. During the later stages of prolonged incubation the organisms destroyed the volatile acid radicals at room temp., but at 37° they attacked the amino acids and nonvolatile amines in preference. B. C. A.

Control of reaction in cultures and enzymic digests. Comparison of the effects of certain salts on changes in p_H and changes in absolute $[H^+]$ with reference to enzyme action. Role of creatinine in the control of reaction in cultures. F. W. Foreman and G. S. G. Smith. *Dept. Sci. Ind. Research, Food Investigations* **1928**; *Special Rept.* No. **32**, 27 pp.—Examn. of the p_H value and titratable acidity of ox-heart exts. in which *Staphylococcus aureus* has been growing for varying periods indicates that phosphates and creatinine, which are present in the ratio of 1.7:3.0, are largely responsible for the resistance to changes of p_H on addn. of acid. The influence of salts on the activities of enzymes and bacteria in media should be considered from the point of view of their effect not only on the p_H values (buffer action), but also on the abs. $[H^+]$ and $[OH^-]$ (depressor effect). In the region of $[H^+]$, where phosphates have little depressor effect, the action of creatinine in facilitating the continued growth of acid-producing organisms is demonstrated B. C. A.

Behavior of d'Herelle's lytic principle (bacteriophage) toward collodion membranes and in distilled water. L. Villa. *Folia clin. chim. microscop.* **1**, 52–7(1926).—The lytic principle behaves like a colloid with large micelles It does not pass a collodion filter. In distilled water the active bacteriophage can be isolated and is apparently visible with an ultramicroscope. B. C. A.

Studies of pathological protein destruction. II. The butyl alcohol soluble mono-amino acids obtained from the proteolytic hydrolysis of casein by the colon bacillus. M. Schierge. Med. Klin. Leipzig. *Z. ges. exptl. Med.* **53**, 44–56(1926); cf. *C. A.* **21**, 434.—Three hundred g. casein was digested for 9 months with the protease obtained from 8 l. of a *B coli* culture. 0.6 g. tyrosine, 0.5 g. leucine; 30 mg. phenylalanine and some tryptophan were obtained. Bibliography. F. L. Dunn

Bacterial oxidation. Gilvert and Subramanian. *J. Ind. Inst. Sci.* **8**, 147–72 (1928); *Deut. Essigind.* **32**, 281–3, 289–92, 299–301(1928) —A series of expts. on the oxidation of EtOH to AcOH is described and the results obtained thereby are tabulated. Among the results accomplished were: development of vigorous pure bacterial cultures for mass production, involving exptl. study of the influence of varying quantities of inoculating cultures; the accelerating influence of certain catalysts, particularly EtOAc and Mn salts; the favorable influence of forced aeration in the slow acidification process was demonstrated, although a critical line of demarcation exists beyond which aeration should not go, this limit depending on the content of bacteria in the culture liquid, as also on the presence of EtOH; it is shown that up to 4% the progress of acid formation is independent of the alc. concn. employed; the acidification process under forced aeration was carried on from 8.8%, whereby 0.8% by vol. alc. was oxidized daily, the process being continued successfully to the end; in order to protect the cultures from infection a liquid temp. of 32° is necessary; the oxidation of AcOH in CO_2 was systematically studied, as also the influence of foreign organisms; the checking effect of $Ca(OAc)_2$ was detd W. O. E.

Euglena in relation to combined nitrogen. Daggmar H. Peterson. *Rep N. J. Agr. Expt. Sta., Dept. Sewage Disposal* **1927**, 310–5; *U. S. Pub. Health Eng. Abstract* **E-637b**, 19(1928).—A single expt. was made using liquid from a resting Imhoff tank which contained chlorophyll-bearing *Euglena polymorpha*. A portion of this was used as a control and to another portion was added lactic acid to the amt. of 0.6%. By making frequent chem. analyses for ammonia N and total N, p_H and detg the bacterial and protozoa counts, P. concludes that colorless *Euglena* in a nutritive medium consumes rather than increases the amt. of combined N. C. R Fellers

The action of hydrogen peroxide upon aerobic spore-forming organisms. Hedwigh Rieger and Richard Trauner. *Arch. Hyg.* **98**, 176–90(1927).—H_2O_2 is effective sporicide, and resembles steam in its effect. Even with very high conc of H_2O_2 considerable time is required for the action to be complete; while small conc are sufficient if time is allowed. P. Y. Jackso

Bacteriophage. Investigation of the colon bacteria of cattle. GEORG MAJER. *Arch. Hyg.* 98, 195–228(1927).—The bacteriophage reaction occurs in milk and milk products. By the action of a bacteriophage adapted to an acid medium the swelling of cheese may be decreased. The action of colibacteriophage is halted by the presence of quinine-HCl. The bacteriophage cannot diffuse through an agar gel, but an enzyme-like substance is produced which does diffuse through the gel. P. Y. JACKSON

An investigation of the biology of Oidium albicans and of the pathogenesis of disease due to this organism. I. KARL KRAUSPE. *Krankheitforsch.* 4, 1–28(1927).—The formation of thread-like growths of *Oidium albicans* takes place best with a p_H near the neutral point and with a const. low surface tension of the surrounding medium, such as is secured with solns. of dextrin and gelatin. A strongly acid or alk. reaction, or a high surface tension causes the growth of yeast-like cells of the organism. The extremes of p_H between which the organism lives are about 3.8–8.1. When the organism is grown upon solns. of various sugars, glycerol or bouillon in 1% concn., it thrives only when mannitol, grape sugar, or milk sugar is used; in these solns. much acid was formed by the growth process. Such body fluids as bile, solns. of the bile acid salts, blood, serum, etc., were physicochemically suitable for the growth of the organism. II. *Ibid* 4, 139–63.—Peroral infection of white rats or white mice with *Oidium albicans* leads to a growth of the organism in the esophagus and stomach; sometimes the esophagus is completely closed. In starving rats the course of infection is sometimes more rapid. When the animals are given strong acid or alk. food no special symptoms are observed; but the form of the organism is observed to vary. Continued treatment with the organism leads to a gradual intensification of the symptoms, and frequently to death. P. Y. JACKSON

The effect of oxygen on the motility of cholera vibriones. M. VAN RIEMSDIJK. *Nederland. Tijdschr. Hyg. Microbiol. Serol.* 3, 1–21(1928).—When broth is inoculated with cholera vibriones it first becomes cloudy, then some of the cloudiness rises to the surface covering it with a pellicle. In a hanging drop taken from the pellicle the vibriones (v.) show a very rapid movement which begins to slow down in about 24 hrs. At the same time the v. grow shorter and plumper. Autoagglutination sometimes takes place after several days. In a hanging drop drawn from underneath the pellicle the movement is very slow and hardly discernible from the Brownian movement. About 24 hrs. later the movement becomes rapid and is assocd. with increasing autoagglutination and involution (a great variety of involution forms is shown in drawings). After 3–4 days v. detach themselves from the clumps and resume their rapid motion. Eventually agglutination and immobilization take place. The v. are characterized by great individual variability. The *El Toro* v. differ from the *Metchnikov* v. in that even pellicle v. show slight motility. The rising of some colonies to the surface is attributed to the O_2 need of the "bottom" drop; the agglutination and involution of these v. are a result of O_2 deficiency and of the action of own metabolites as well as of those of the top v. The bottom v. are apparently far more sensitive to stimuli. The clinical and perhaps also the epidemiological behavior of cholera exhibits a certain analogy with this bacteriological "individualism" and sensitization. MARY JACOBSEN

Effect of the nature of peptone on Eijkman's fermentation test. J. DE GRAAF. *Nederland. Tijdschr. Hyg. Microbiol. Serol.* 3, 22–38(1928) —It has been observed that water of the Maas River gave fermentation in Witte's peptone (*W*), but not in Poulenc peptone (*P*). Pure *colon* cultures gave fermentation in both. The difference between the peptones was not attributable to the initial difference in p_H ($W = 6.5$, $P = 5.3$), although controls showed that an initial p_H 5.0 prevented fermentation. Nor was it the end p_H which was always 4.6–4.9 with or without fermentation. It was caused by the addnl. acidity produced by streptococci which were present in the river water and which developed better in *P* than in *W*. This was already indicated by the more rapid decrease of p_H in *P* (after 6 hrs. 4.5 in *P*, 5.5 in *W*). The inhibiting action on the *B. coli* of these acid-forming streptococci was partly counteracted by gelatin-melting bacteria also present in the water provided they were sufficiently numerous. These bacteria grew in *W* only. Conclusion: Poulenc peptone should not be used for test media. MARY JACOBSEN

The biological properties of cholera-like vibriones. V. A. MASLENNIKOVA. Woronesher Senit-Bacteriol. Inst. *Centr. Bakt. Parasitenk. I Abt.* 102, 148–57(1927).—The cholera-like vibriones fall into 3 groups, acid formers, alkali formers and a chemically inactive type. They breed true to type. JOHN T. MYERS

Culturing the tubercle bacillus and the importance of culture method in diagnosis. ERICKA HERRMANN. Univ. Freiberg. *Centr. Bakt. Parasitenk. I Abt.* 102, 169–73 (1927).—The antiformin method is preferable to the H_2SO_4 method. J. T. M.

How does the Shiga bacillus ferment? The biology of Bacillus metacoli (Morgan). NIELS DUNGAL. Statens Serum Inst., Kopenhagen. *Centr. Bakt. Parasitenk, I Abt.* **102,** 218-24(1927).—The acid-forming power of 14 strains of Shiga bacilli on 26 carbohydrates was as follows: glycerol^{+} (late), erythritol^{-}, adonite^{-} dulcitol^{-}, mannitol^{-}, sorbitol^{+-}, inositol^{-}, xylose^{-}, *l*-arabinose^{-}, *d*-arabinose^{-}, rhamnose^{-}, glucose^{+}, levulose^{+}, galactose^{+}, mannose^{+}, lactose^{+-}, saccharose^{+-}, maltose^{+-}, trehalose^{+-}, raffinose^{-}, melezitose^{-}, dextrin^{-+}, inulin^{-}, starch^{-+}, amygdalin^{-}, salicin^{-}. The fermentation reactions are not quite const., but sufficiently so to distinguish between intestinal organisms. JOHN T. MYERS

The action of bile on enterococci and streptococci. WALTER LÖWENBERG. Rudolph Virchow-krankenhause in Berlin. *Centr. Bakt. Parasitenk. I Abt.* **102,** 244-5 (1927).—Enterococci will multiply in human bile in the majority of cases while *Streptococcus hemolyticus* and *viridans* will usually die within 24 hrs. Na taurocholate acts in the same way. JOHN T. MYERS

Bacteriophage phenomena in the case of a water bacterium, B. cloacae Szegediensis crystalliformans. A. V. JENEY. Franz-Joseph Univ., Szeged. *Centr. Bakt. Parasitenk. I Abt.* **102,** 263-8(1927).—A bacterium was isolated from sewage-contaminated water, described and named as above. A bacteriophage was found in culture filtrates which caused lysis in liquid and in solid media. In agar plates after 3 or 4 days incubation, and before the medium dried out, crystals visible to the naked eye appeared in the lytic zone. Attempts to isolate enough of them for recrystn. were unsuccessful. It is not known whether they are org. or inorg. Enough were fished out for the detn. of crystallographic data. They belong morphologically and optically to the rhombic system, and are elongated in the direction of the vertical axis. There are 2 vertical axes with an angle of about 8 to 10°. The index of refraction is slightly greater than that of Jena glass. Double refraction is weak. The color is grayish white, large masses appearing yellow. They often form aggregates with the longer planes in apposition, and tend toward a radial arrangement. They disintegrate in the air. JOHN T. MYERS

Endotoxins of the paratyphoid-enteritidis bacteria. LOUIS BAHR AND AAGE DYSSEGAARD. *Centr. Bakt. Parasitenk. I Abt.* **102,** 268-97(1927).—The endotoxin from 32 freshly isolated strains was studied. Animals were inoculated intraperitoneally and by mouth. The toxins were strongest in 9 to 16 day bouillon cultures. p_H had little effect. The no. of organisms is important. Toxicity and virulence are not always parallel. JOHN T. MYERS

A method of selective enrichment for paratyphoid in water and feces. FRIEDRICH HODER. Univ. Prague. *Centr. Bakt. Parasitenk. I Abt.* **102,** 313-9(1927).—The addn. of malachite green (between 1:5000 and 1:10,000) to a medium consisting of 10% bile in bouillon favors the growth of paratyphoid bacilli. JOHN T. MYERS

Coagulation of egg yolk by cholera and cholera-like organisms, and consideration of the resulting products. V. S. DERKACH AND B. BRECHER. Bact. Inst., zu Charkow. *Centr. Bakt. Parasitenk. I Abt.* **102,** 319-26(1927); cf. *C. A.* **22,** 1173.—Sp. cholera always coagulates egg yolk, but many of the cholera-like organisms do not. Egg yolk and milk coagulation are not always parallel. JOHN T. MYERS

Lytic enzymes in the pseudobacteriophagy of anthrax. GYULA DE DARÁNYI. Tierärtzlichen Hochschule Budapest *Centr. Bakt. Parasitenk. I Abt.* **102,** 326-9(1927). JOHN T. MYERS

Studies on the biological properties of Besredka filtrates. I. Inhibiting factors in filtrates of bouillon bacterial cultures. G. S. BARG. Bact. Inst., Kiew. *Centr. Bakt. Parasitenk. I Abt.* **102,** 398-406(1927).—Staphylococcus filtrates had an equally bad effect on homologous and heterologous strains of staphylococci. Streptcoccus filtrates inhibited heterologous as well as homologous strains of streptococci. Staphylococci will grow in streptococcus filtrates but streptococci will not grow in staphylococcus filtrates. JOHN T. MYERS

The action of fatty acids and their products on the morphology and staining reactions of bacteria. DEMETRIOS PETROCHILOS. Univ. Heidelberg. *Centr. Bakt. Parasitenk. I Abt.* 102, 471-7(1927).—Fatty acids exert an inhibiting action on various bacteria. This effect gradually decreases from the lower to the higher members of the series. Fatty acid products with a moderate no. of C atoms have a still greater inhibiting action. JOHN T. MYERS

The decolorizing properties of Chinese India ink in bacteriological technic. GUSTAV HOCHMILLER. Tierärtzlichen Hochschule, Wien. *Centr. Bakt. Parasitenk. I Abt.* **102,** 478-84(1927).—India ink has a definite decolorizing action on bacteria stained

with basic aniline dyes. When stained with aq. dyes, decolorization is complete. Tubercle bacilli are only slightly decolorized by the following technic, but non-pathogenic acid-fast bacteria are completely decolorized. Stain by the Ziehl-Neelsen method, omitting the acid alc. · Place a drop of ink at the edge of the smear and draw it over with a slide exerting some pressure and dry after 20 sec.: or cover with ink and heat for a few sec. over a flame: or shake in a container of ink for several seconds. Gram-negative organisms are much more readily decolorized than Gram-positive ones.
JOHN T. MYERS

The cultivation of the tubercle bacillus in negative sputum. IGNAZ SCHILLER. Reichslaboratorium Chem. Bact. and Laboratorium des Roten Kreutzes. Odessa. *Centr. Bakt. Parasitenk. I Abt.* **108**, 1-7(1928).—The following medium is used for the treatment of sputum which is neg. for tubercle bacilli on direct examn.: glycerol 75 cc., distd. water 25 cc., and glucose 2 to 5 g. It need not be sterilized. Equal vols. of sputum and the medium are mixed and incubated for 24 hrs. at 37°. Smears prepd. as usual must be washed with boiling water after flame fixation, to remove all traces of glycerol which interfere with the Ziehl-Neelsen staining technic. In sterile tissue bacteriolysis of tubercle bacilli occurs quickly. When pieces of sterile guinea pig tissue finely minced are added to this medium (2 lungs or 1 liver to 100 cc.), growth occurs rapidly, reaching a max. in 9 days. Ordinary media contg. the percentage of glycerol in this medium will not permit growth. In hydrolyzed sputum, the tubercle bacilli often disappear. If placed in the glycerol reagent for 24 hrs. rods again appear. They may have gone into the filterable state which some investigators have reported. Such hydrolyzed sputum will not infect animals. JOHN T MYERS

A study of the virus of poliomyelitis, encephalitis and herpes. M. GERBASIS AND M. GUIFFRÈ. Universitätskinderklinik zu Palermo. *Centr. Bakt. Parasitenk. I Abt.* **108**, 58-87(1928).—It is possible to cultivate the virus of herpes simplex, of encephalitis, and of poliomyelitis in the anaerobic medium of Noguchi or of Di Cristina. Growth appears in about 1 month at 37°. In freshly isolated cultures a diffuse cloudiness appeared, but in later generations, granular material appeared along the walls of the tube, consisting of very small cocci. Complement-fixing bodies were present in the blood serum cases of herpes and of animals inoculated with an antigen made by drying herpes cultures at 40° and extg. with alc. for 7 days at 37°, the filtrate then being titrated. Blood from cases of encephalitis and of poliomyelitis after recovery contained antibodies for encephalitis but not for herpes cultures. The virus of herpes differs from that of poliomyelitis and encephalitis, the latter being closely related.
JOHN T. MYERS

Capsule substance from Bacillus avisepticus. F. HOFFENREICH. Univ. Budapest. *Centr. Bakt. Parasitenk. I Abt.* **108**, 87-9(1928).—A polysaccharide was isolated as follows. Make a heavy suspension of *B. avisepticus* in isotonic NaCl soln. from 24 hr. horse-muscle infusion agar cultures. Add sufficient KOH and KOAc to make the concn. of each 2%. Heat for 2 hrs. on the water bath. Centrifugalize and neutralize the liquid with HOAc. Add 1 third vol. of satd. U acetate and filter to remove protein. Add KOH and filter to remove U. Dissolve in HOAc. Add Na phosphate and remove the U phosphate ppt. with the centrifuge. The yellowish liquid obtained gives the brown color reaction of glycogen with Lugol's soln. It reduces Fehling's and Benedict's soln. It contains only a trace of N. To some of the liquid an equal vol. of abs. alc. was added. After 24 hrs it was filtered and the residue washed with a mixt. of 2 parts abs. alc. and 1 part ether and dried in a desiccator. With a serum which agglutinated *B. avisepticus* at 1:640, a 1% aq. soln. of this substance gave a ppt. at 1:640,000. The reaction was sp. Rabbits could not be immunized with this substance.
JOHN T. MYERS

A simple plate method for cultivating obligate anaerobes (anaerobic bacilli, filterable anaerobic, bacteria, Treponema pallidum). JOSEPH FORTNER. Robert Koch Inst., Berlin. *Centr. Bakt. Parasitenk. I Abt.* **108**, 155-9(1928).—*Treponema pallidum* will produce surface colonies on rabbit blood agar without glucose in ordinary Petri dishes, if $^1/_3$ of the plate is inoculated with *B. prodigiosus* to remove O and the dish sealed with "plastilin." *Bact. pneumosintes, B. tetani, botulinus, histolyticus, putrificus verrucosus, sporogenes* and *Amylobacter* were grown in a similar manner on sheep blood agar with glucose. *B. coli* could be used instead of *B. prodigiosus*, but *B. proteus* was not so good.
JOHN T. MYERS

The conservation of bacterial cultures with paraffin. GYULA DE DARÁNYI. Univ. Budapest. *Centr. Bakt. Parasitenk. I Abt.* **108**, 160-2(1928).—The surface of a slanted medium is dried at 45° and inoculated. When growth appears, the tube is filled with paraffin about 1 cm. above the top of the slope. Fragile organisms like streptococci

remain viable several months. More resistant ones like *B. pyocyaneus* live for 1.5 years.
JOHN T. MYERS

The differentiation of virulent and avirulent strains of B. mallei by means of methylene blue reduction. B. M. GURNIVITSCH. Mil. Veterinar-Bact. Lab. Nr. 1 Uvo. *Centr. Bakt. Parasitenk. I Abt.* **108**, 177-85(1928).—The rate of reduction of methylene blue by *B mallei* is in direct proportion to the no. of bacilli. Avirulent strains grow more luxuriantly; hence they reduce the blue more rapidly. The difference is more marked with 1% concn. of methylene blue in the medium than with 0.25%. Avirulent strains remain decolorized as long as a month, while virulent strains begin to show reoxidation by the air within 48 hrs. The culture medium used was 3% beef infusion broth. The addn. of 2.5% formalin to the incubated culture inhibits reduction, but toluene facilitates it. JOHN T. MYERS

The influence of carbohydrates and of hydrogen-ion concentration on the sporulation of saccharomycetes. FELIX WAGNER. Tech. Hochschule in Wien. *Centr. Bakt. Parasitenk. II Abt.* **75**, 4-24(1928).—Carbohydrates have a marked and sp. influence on sporulation of yeasts. The effect of the same carbohydrate may differ with different species. In general fermentable carbohydrates stimulate sporulation more than do non-fermentable ones. Previous growth in a medium contg. one sugar may prevent another sugar from stimulating sporulation when it is added. Glucose and beer wort have the greatest augmenting effect. The opt. percent of sugar is 10, but even traces will cause sporulation. The age of the culture when the sugar is added, up to 7 days, has no significance except in the schizosaccharomycetes, which are very sensitive. H-ion concn. limits are narrower for sporulation than for vegetable growth. Of the organisms, Tries saccharomycetes Johannesberg had the widest range, p_H 2.4 to 9.07. The percentage sporulation does not vary much within these limits. The acid range is always longer than the alk. range. Growth may continue at somewhat higher or lower p_H values. Wood blocks are a satisfactory means of preventing increase in alky., free OH ions being bound by lignin. Gypsum acts in the same way but even more rapidly. Sticks of Al_2O_3 are unsatisfactory because partly hydrolyzed. J. T. M.

Comparative studies on acid formation by Bacillus Delbrücki and the cold lactic acid bacilli (Bacterium acidi lactici and Bact. cucumeris fermentati Henneberg). STAIGER AND M. GLAUBITZ. *Centr. Bakt. Parasitenk. II Abt.* **75**, 25-8(1928).—The acid was detd. in cultures of *Bact. Delbrücki* and in mixed cultures of *B. acidi lactici* and *B. cucumeris* in the following media using 250 cc. amts. *Cucumeris* was incubated for 18 days at 45° and the others were incubated for 18 days at room temp. The results are given as cc. of *N* lactic acid. (1) represents Delbrücki and (2) the others. Saccharose 5%, yeast ext. (as a source of N); (1) 17.5, (2) 26.25%: Saccharose 10%, yeast ext. 3%; (1) 21.25%, (2) 36.25%: Dextrose 5%, yeast ext. 1.5%; (1) 8.75, (2) 23.75: Dextrose 10%, yeast ext. 3%; (1) 10.0, (2) 33.75: Maltose 5%, yeast ext. 1.5%; (1) 12.25, (2) 28.75: Maltose 10%, yeast ext. 3%; (1) 12.25, (2) 35.0: Molasses 10% (50% cane sugar with other substances which act as a source of N), yeast ext. 1.5%; (1) 28.75, (2) 45.0: Molasses 20%, yeast ext. 3%; (1) 35.75, (2) 57.5: Molasses 10%, (1) 11.25, (2) 18.75: Molasses, 20%, (1) 12.5, (2) 20.0. JOHN T. MYERS

The precipitation of iron compounds from salts of organic acids by some species of Eubacteriales. I. M. LEWIS. Univ. of Texas. *Centr. Bakt. Parasitenk. II Abt.* **75**, 45-52(1928).—The pptn. of Fe by a large no. of common species of the Eubacteriales group was studied. Standard agar was compared with the following synthetic medium: KH_2PO_4, $MgSO_4$, $NaNO_3$, NH_4NO_3, each 0.05%; $CaCl_2$, 0.02%; in distd. water 0.1% of the Fe salt was added. Various species from widely sepd. families can deposit Fe while closely related species may differ. Strains which ppt. Fe are distinguished from those which do not by their ability to use the org. radical as food. Natural waters and displaced soil solns. do not contain the opt. amt. of phosphates for bacterial pptn. of Fe from org. Fe compds. If phosphate is added pptn. becomes much more rapid. Pptn. of Fe occurs in the presence of other C comps., thus showing simultaneous utilization. The citrates, tartrates and albuminates of Fe are best for use in culture media. Because of their wide distribution in soil and water, the colon group and the green fluorescent bacteria are probably the most important forms of the true bacteria in natural Fe pptn. Fe deposition may be used as a differential test to det. either the utilization of certain org. acids, or N requirements. It affords a convenient method for differentiation in the colon of *Salmonella* and *Eberthella* groups. J. T. M.

The decomposition of fatty acid salts and carbohydrates by thermophile bacteria. C. COOLHAAS. Landwirtschaftlichen Hochschule zu Wageningen, Holland. *Centr. Bakt. Parasitenk. II Abt.* **75**, 161-70(1928).—The medium used contained NH_4Cl 1 g., KH_2PO_4 1 g., and $MgSO_4$ 0.5 g. The incubation period varied from 5 to 14 days.

Slime from stagnant water was the inoculating material. At 60° a long list of fatty acid salts were changed to methane and CO_2. The minimal temp. was 45° and the max. 69°. The organisms concerned were spore-forming slender rods different from the bacteria which cause a similar fermentation at lower temps. They cause a quant. fermentation of KOAc and KHCHO to methane, CO_2 and K_2CO_3. Saccharose goes completely to methane and CO_2, but this occurs only after the organisms in a culture increase greatly in no. Cellulose incubated with the same slime goes largely to methane and CO_2, but the compn. of the resulting gases is variable. Fallen cabbage leaves (dry matter 19 to 20%) when inoculated with slime yield much more methane at 60° than at 26°, and at 37° there is very little. At 60°, 100 g. of cabbage yields about 5.3 l. of methane in 20 days. JOHN T. MYERS

Biochemical properties of lactic acid microörganisms. II. Morphological and biochemical characteristics of Bact. caucasicum. I. A. MAKRINOV AND X. STROHBIDER. Inst. zu exper. Medizin, Leningrad. *Centr. Bakt. Parasitenk. II Abt.* **75,** 171–8(1928); cf. *C. A.* **22,** 3427.—*Bact. caucasicum* is a true lactic organism since it can ferment the mono- and disaccharides among the hexoses and mannitol among the alcs. and does not ferment starch, inulin, xylose, arabinose and gum arabic. It hydrolyzes protein, producing much lactic acid and only minimal quantities of other substances. It does not attack fats. JOHN T. MYERS

Cellulose as a source of energy for the non-symbiotic nitrogen-fixing organisms. PAULI TUORILA. Fidgen. Tech. Hochschule, Zurich. *Centr. Bakt. Parasitenk. II Abt.* **75,** 178–82(1928).—*Azotobacter* cannot use cellulose as a source of energy when in pure culture, but it may if mixed with other organisms. Probably other species assimilate cellulose, producing products which act as a source of energy for *Azotobacter.* The process is greatly facilitated by the addn. of small quantities (about 0.1%) of mannitol or glucose. JOHN T. MYERS

Observations on the physical and biological characteristics of Leptospira. I. J. KLIGLER AND M. ASHNER. Hebrew University, Jerusalem. *J. Bact.* **16,** 79–96(1928).—Spirochetes carry a pos. charge whereas the bacterial charge is neg. At p_H 9.2 they become negatively charged. In the absence of colloids (serum, peptone, etc.) the leptospiras are exceedingly sensitive to reaction and salinity. Without a serum buffer they die promptly at a p_H of 6.6 but are much less sensitive to alky. The opt. is between p_H 7.2 and 8.2. There are slight differences in the sensitiveness of different strains, due probably to differences in vigor, but the general behavior is the same. Salts are decidedly harmful. Even isotonic NaCl injures them. H_2O_2 solns. of 1:9000 kill them in a few sec. They are readily cultivable on artificial media. The best procedure for primary culture from animals is to cover the blood-free fibrin clot or sedimented red cells with Noguchi *Leptospira* medium to a depth of 1.5 to 2.0 cm. They are obligatory aerobes. Only a small proportion of the organisms will pass through a Berkefeld or Seitz filter. Centrifugation for 4 or 5 hrs. will practically free a suspension of organisms. JOHN T. MYERS

The action of iron and citrate in synthetic media for tubercle bacilli. GUILFORD B. REED AND E. RICE. Queen's Univ., Kingston, Toronto. *J. Bact.* **16,** 97–107(1928).—The addn. of about 0.056 g. of Fe per cc. in the form of chloride or sulfate to a synthetic medium (asparagin 4 g., NaCl 5 g., NaH_2PO_4 2 g., glycerol 30 g. and water 1000 cc.) over the ordinary p_H growth range of tubercle bacilli results in almost complete pptn. of the Fe. The addn. of 0.2 g. of Na citrate per cc. of medium, probably through the formation of complex ions, inhibits the pptn. of Fe. In the above synthetic medium adjusted to p_H 7.4, the addn. of the Fe produces approx. 20% more growth, and the addn. of both the Fe and the citrate about 100% more growth. In more acid and more alk. media the advantages are less conspicuous. Similar results are obtained with *B. phlei* and *B. leprae* in these media. JOHN T. MYERS

Variations of streptococci with a note on hemolysis production. M. FROBISHER, JR., AND E. R. DENNY. Johns Hopkins Univ. *J. Bact.* **16,** 109–16(1928).—Differentiation of streptococci should be based on low-power microscopic observation of deep and not of surface colonies in blood agar plates, and the use of tube hemolysin tests. The tube tests should be made by mixing 1 cc. of an 8 to 12 hr. 20% horse serum broth culture to 1 cc. of a 5% suspension of washed rabbit erythrocytes and incubating for 1 to 2 hrs. at 37° in a water bath. Genuine alpha (viridans) streptococcus surface colonies frequently produce hemolytic zones 2 to 4 mm. wide which appear to the naked eye to be beta (hemolytic) colonies. When the deep colonies of such streptococci are viewed with the low power of the microscope, they are seen to have about them within the hemolyzed zone the zone of methemoglobinized cells characteristic of the alpha type. These strains never caused hemolysis in the tube tests. A no. of such

strains have been found to lose a large part of their hemolytic powers when kept for some time under various artificial conditions. This may be due to a change in the organisms or to some obscure variation in technic. This may explain some of the reported changes of a beta to an alpha type. JOHN T. MYERS

Streptococcus studies. I. Streptococcus viridans derived from single cell strains of Streptococcus hemolyticus. FRANCIS B. GRINNELL. Harvard Univ. Medical School. *J. Bact.* **16**, 117-21(1928).—Single-cell strains of hemolytic streptococci gave rise in 2 instances to daughter strains having all the characteristics of the α-type. One such variant appeared as a few colonies on blood agar plates from the 14th subculture in normal horse-serum broth, and another in a similar way from the 21st subculture of a strain cultivated on blood agar at 40°. Such a change appeared only with certain strains, and the whole culture does not change. The α- variants remained true to type under ordinary conditions of cultivation. They showed a slight loss of virulence, and usually gave the same fermentation reactions as the β- types from which they were derived. JOHN T. MYERS

Hemolytic reactions of a pathogenic bovine strain of B. coli. MARION L. ORCUTT. Rockefeller Inst. for Medical Research, Dept. of Animal Path., Princeton, N. J. *J. Bact.* **16**, 123-34(1928).—Of 14 bovine strains of *B. coli*, one was hemolytic. One of these was studied in detail on solid and liquid media. The hemolytic agent is a product of the living culture, not an end product of growth, since both filtrates and killed cultures were non-hemolytic. The hemolytic action is greater in 4 than in 24 hour bouillon cultures, also in bouillon cultures than in agar growths suspended in isotonic NaCl soln In general the hemolytic power is proportional to the no. of living organisms, but this may be obscured by inhibiting factors, as too much peptone or unknown substances in the veal infusion, or both. Cholesterol and certain N sera are also inhibitory. Either aerobic or anaerobic incubation will produce hemolysin. p_H affected hemolytic activity only when it checked growth. The hemolytic agent is active at refrigerator temps. The low titer of cultures kept in the refrigerator is apparently due to decreased production rather than loss of activity. No hemolysin is formed in a culture fluid of NaCl soln. and glucose. The hemolytic substance seems to possess slight antigenic power, since immunization will increase or originate inhibitory power. In media which allowed the culture to form acid, an acid type of hemolysis occurred, but it differed from the other in being more diffuse on blood agar plates, by changing the color of the blood to a brownish shade, and by not being inhibited by serum. A non-hemolytic variant was obtained after long cultivation. **Effect of sera on the hemolytic reactions of a pathogenic bovine strain of B. coli.** *Ibid* 135-43.—Normal horse, cow and human sera prevented hemolysis by this strain of *B. coli*. Rabbit, guinea pig and calf sera caused little or no inhibition. This is probably due partly but not entirely to the cholesterol content of the serum, since inhibiting power is not always parallel to cholesterol content. Apparently the protein of horse and cow serum has inhibiting powers. Rabbit and horse serum have a different protein compn. which may explain differences in inhibition. The same is true for calf and cow serum. Milk will not prevent hemolysis The albumin-globulin ratio in serum may be a factor. In immune serum antibodies seem to play a part in inhibition of hemolysis. JOHN T. MYERS

Studies in the physico-chemical behavior of bacteria. ALLEN E. STEARN AND ESTHER WAGNER STEARN. *Univ. of Missouri Studies* [2], **3**, 1-84(1928).—Much of the physiol. as well as the physico-chem. behavior of bacteria can be ascribed to their amphoteric character, and the deviations from the behavior of solns. of single pure ampholytes shown by organisms are what one would expect from a system composed of more than 1 amphoteric component. Exptl. results are presented showing: (1) bacteria possess individual characteristic isoelec points and isoelec. ranges; (2) the organisms with isoelec. points at lowest p_H values retain cations most strongly, and vice versa for anions; (3) the higher the p_H of reaction the more strongly are cations retained and vice versa for anions; (4) any change affecting the isoelec. point affects also the retention of cations and anions; (5) organisms with isoelec. points at lowest p_H values are most sensitive to the toxic effect of cations; (6) any organism becomes more sensitive to the toxic action of cations as the p_H is increased; (7) any process which causes a shift in the isoelec. point of an organism alters its sensitivity to anions and cations; (8) the toxic action of many bacteriostats, notably dyes, seems to partake of the nature of an ionic equil.; this equil. can be easily shifted without altering relative quantities of bacteria and bacteriostat but upon so shifting the effect of the bacteriostat is markedly altered. Data obtained from a study of simple synthetic systems of more than 1 amphoeric component show analogous behavior to bacterial systems so far as

the analogy is experimentally carried. Expts. on flocculation by dyes, in which it is shown that basic dyes are increasingly effective as flocculating agents as the p_H is increased and acid dyes are increasingly effective as the p_H is decreased, indicate that the same fundamental mechanism is effective here as in staining and in growth inhibition. A discussion of the Gram reaction and of bacteriostasis is given. A. E. S.

D—BOTANY

THOMAS G. PHILLIPS

Dependence of the chemical composition of oil-containing plants on the climate. S. Ivanov. *Oil and Fat Industry* (Russia) **1927**, No. 5, 29–31, No. 6, 26–30; *Chem. Zentr.* **1928**, II, 1971.—The I no. is higher in northern climates than in southern. When plants are transplanted from one climate to another the oil content changes to correspond with the climate. A. A. Boehtlingk

The chemical nature of the poison in nettles. Ferdinand Flury. Univ. Würzburg. *Z. ges. exptl. Med.* **56**, 402–9(1927).—The hair of the stinging nettle contains an acid juice comprising small quantities of formic, acetic, butyric and other aromatic fatty acids in which the nettle poison is dissolved. The nettle poison is a resinous, non-aromatic, unsatd. N-free, acid substance. 0.0001 mg. will give the characteristic action on the skin. F. L. Dunn

Composition and structure of the cell wall of wood. Geo. J. Ritter. U. S. Forest Products Lab., Madison, Wis. *Ind. Eng. Chem.* **20**, 941–5(1928).—Continuing previous studies (*C. A.* **20**, 221) it is shown that lignin in woods examd. is of 2 kinds, one in the middle lamella and the other in the cell wall. Samples of sufficiently small dimensions were prepd. from pine, basswood and red alder; the 2 varieties of lignin were present in them in approx. equal amts., and the middle lamella lignin is more sol. in 95% EtOH than the cell wall lignin. When bordered pits are observed between Nicol prisms the optical effects produced are explained on the basis of the chain-like arrangement of the cellulosic material of the cell walls. When lignified and delignified wood fibers are treated with swelling agents, the fiber walls thicken both outwardly and inwardly, the general angular cross section area of lignified fibers remaining unaltered, but that of delignified fibers changing to a circular form. The cell walls are composed of several layers which can be sepd. by chem. means, *e. g.*, as by treatment with 68% H_3PO_4. Seventeen illustrations (photomicrographs) are appended. W. C. Ebaugh

Sweet corn seed studies. A. T. Erwin and E. S. Haber. Ia. Agr. Expt. Sta., *Bull.* **250**, 252–78(1928).—Sweet corn seed matures slowly and, because of its high sugar and H_2O content, is readily subject to mold invasion and damage in handling. Kiln drying at 100° F. is effective in drying seed corn of excessive H_2O content without impairment of germinating vigor. Immature sweet corn when kiln dried gave equally good germination as mature seed, though the seedlings were not as vigorous. C. R. Fellers

The relation of Bacterium vignae to the tissues of the lima bean. W. S. Beach. Penn. Agr Expt. Sta., *Bull.* **226**, 1–15(1928).—The migration of *Bacterium vignae* through the tissue of the lima bean is in the form of zoogloea. The matrix material in which the bacteria are embedded stains faintly in early stages but more deeply in later stages of growth which is mostly intercellular. The first reaction resembles plasmolysis, followed by disintegration of the plasma, the plastids and the nuclei. C. R. Fellers

Physical and chemical characteristics of expressed citrus-leaf sap and their significance. A. R. C. Haas and F. F. Halma. Univ. California. *Bot. Gaz.* **85**, 457–61 (1928).—The sap of normal mature lemon leaves is less active osmotically and contains less ash and Ca, but more Mg, than the sap of orange leaves. Benjamin Harrow

Plant coloring matters. VII. Lycopin. P. Karrer and Rose Widmer. Univ. Zürich. *Helv. Chim. Acta* **11**, 751–2(1928); cf. *C. A.* **22**, 394.—Lycopin, m. 173°, is easily reduced with a Pt oxide catalyst in ether soln. The amt. of H absorbed indicates that the formula for lycopin is $C_{40}H_{56}$. "Perhydrolycopin" [the reduction product] $b_{0.03}$ 238–40° without decompn.; it could not be crystallized. Its mol. weight 845 in $CHBr_3$, 837 in camphor and 525 in C_6H_6 indicates also the presence of 40 C atoms in the mol. A. L. Henne

Crystallized carotinoids from buttercup blossoms and hawthorns. H. H. Escher. Univ. Zürich. *Helv. Chim. Acta* **11**, 752–4(1928).—Description of two orientation essays. A minute quantity of xanthophyll has been obtained by a petroleum-ether

extraction of the blossoms of *Ranunculus*. Lycopin was obtained by extn. of hawthorn with petroleum-ether and pptn. with an EtOH-CS_2 mixt. A. L. HENNE

The solubility of phosphorus compounds contained in seeds. ZYGMUNT KOEHLER. *Roczniki Chem.* **7,** 692–706(1927); Abstr. of paper by Koehler, Minkowska and Lindenbaum, *Bull. Acad. Polon. Sci. Lettres Cl. Sci. Mathem. Nat. Ser. B,* **1926,** 707–848, 1007-39, 1041–98.—HCl, 0.1–1%, is most suitable for the extn. of P compds. from seeds. The extd. P increases rapidly with the acid concn. and somewhat with the quantity as long as the acid concn. is low, less rapidly as soon as higher concns. are reached. The inorg. P shows for very low acid concns. an increase followed by a decrease. This is attributed to the activation by lower and inhibition by higher concns. of an enzyme which splits org. P compds. Complete inhibition is effected by 0.1–0.2% HCl but not by 1% AcOH. The sol. org. P (phytin fraction) is extd. completely only by 1% HCl. At this concn. the proportion between extd. material and acid has little effect on the soly. One % AcOH does not completely extract the phytin P, since the extn. depends on the p_H of the soln. The inorg., org., total and phytin P of a no. of seeds is given in tables. For details see the numerous curves in the original. M. J.

Growing reactions produced by the change of hydrogen-ion concentration in germinating roots of Pharbitis hispida Choisy. FERD. HERČÍK. *Spisy vydancane Prirodovedeckour Fakultou Masarykovy Univ.* **1925,** No. 49, 3–20.—The rate of growth of roots of *Pharbitis hispida* Choisy when placed in solns. of different H-ion concn. was detd. When transferred from acid medium to an alk. medium the rate is always decreased except when transferred from p_H 4 to p_H 8. When transferred from alk. medium to acid medium the rate of growth is always increased except when transferred from p_H 10 to p_H 4. Within the acid range lowering the H-ion concn. increases the rate of growth until near p_H 7 where the rate decreases Within the alk. range raising the H-ion concn. decreases the rate of growth until near p_H 7 where the rate increases. H. R. KRAYBILL

Application of the Wood light in the study of plant pathology. L. PETRI. *Boll. staz. sper. ind. mat conrianti* **5,** 201–3(1927); *Chimie et industrie* **20,** 36(1928).—Comparative examn. with Wood's light of decoctions of dried leaves of a given plant can show whether the withering of these leaves was due to a natural cause or to the action of toxic gases, such as SO_2 (cf. following abstr.). A. PAPINEAU-COUTURE

Method of using the Wood light in the study of plant pathology. L. PETRI. *Boll. staz. sper. ind. mat. concianti* **5,** 283–5(1927); *Chimie et industrie* **20,** 38(1928).—The method consists in soaking very pure filter paper by capillary action with water in which the vegetable tissues were crushed, drying and examg. by Wood's light. In order to obtain equal fields so as to have comparable photograms the dilns. of the solns. and the rate of evapn. must be the same in all cases. The fields obtained with tissues killed by SO_2 and with tissues killed by boiling H_2O are not the same. The light-giving substance is probably contained in all living vegetable tissues and is not destroyed by SO_2 or by heating to 100°. If luminescence is absent, or if it is different in different prepns., it is an indication that certain tissue constituents which absorb the rays have also diffused. The photograms of green tissues are the most luminescent, but if the chlorophyll has been extd. with alc. the luminescence is greatly reduced. Dil. H_2SO_4 is apparently without action. The investigations are being continued with a view to detg. a fluoroscopic diagnosis for a few phytopathological cases. A. P.-C.

Biochemical and biophysical investigations of the effect of several important biological factors of the forest on the life and growth of forest trees. DÁNIEL FEHÉR AND ISTVAN VÁGI. *Matematik. Természettudományi Ertesitö* **43,** 539–51(Hung.), 552–60(Ger.) (1926).—A study of the biological factors which control the mass growth of a forest, including the CO_2 content of the air as related to the intensity of light and the bacterial content of the soil, the acidity of the soil and its effect on the growth of individual species, the humus and lime content of the soil, the abs. capacity of the soil for air and moisture, the soil flora with relation to its acidity, etc. The CO_2 concn. is lower near the ground than in normal air and increases up to 2 m. The light intensity in well-covered tracts is very low under the tree crowns, in general 2–15% of the normal intensity in unobstructed light. The effect of increasing the CO_2 concn. is problematical. The question of soil acidity is not so important in forestry as in agriculture. The bacterial content of the soil decreases as the acidity increases and p_H values less than 4 retard the decompn. processes which occur in the humus and consequently retard the growth of the trees. The lowest p_H values were found in well-closed middle-aged coniferous and deciduous forests, and the highest p_H values were found with poorly closed deciduous forests, particularly acacia. No immediate relationship was apparent between acidity and geological soil structure. The acidity is affected by the light

intensity as influenced by tree closure. The air and water capacity of the soil attain the minimum value with complete closure. The best results are obtained with a mixed growth of deciduous and coniferous trees. J. S. REICHERT

Potassium and sodium in marine algae. GABRIEL BERTRAND AND (MME.) M. ROSENBLATT. *Compt. rend.* **187**, 266–70(1928).—K and Na were detd. in 11 species of the more common marine algae. The ratio K/Na ranged from 0.60 to 1.22 in 4 species as collected. Washing the algae in distd. water generally increased the K/Na ratio. Of the washed samples of 11 species only 4 species contained more Na than K. It is, therefore, a mistaken tradition that *Fucus* and other marine algae contain little or no K. L. W. RIGGS

Genesis of starch in the bean. H. COLIN AND R. FRANQUET. *Compt. rend.* **187**, 309–11(1928).—In the following table $[\alpha_1]$ and $[\alpha_2]$ indicate the rotatory power of the total sugars before and after inversion, *T* the percentage of total sugar calcd. to fresh tissue, *R* reducing sugar, *S* sucrose, *St* stachyose (cf. Tanret, *C. A.* **7**, 1739) and *A* starch:

	$[\alpha_1]$	$[\alpha_2]$	*T*	*R*	*S*	*St*	*A*
Leaf blade	+ 47	—11	0.81	0.32	0.46	0.00	0.44
Leaf petiole	+ 49	+20	1.48	0.91	0.53	.0	0.80
High stalk	+ 34	— 5	1.65	0.89	0.73	.0	1.35
Low stalk	+ 52	—11	0.76	0.11	0.62	.0	1.04
Peduncle	+ 51	—10	0.92	0.33	0.56	.0	trace
Very young pods	— 41	—41	2.24	2.24	.0	.0	1.25
Young pods	— 30	—35	1.53	1.36	0 16	.0	1.67
Mature pods	+ 19	—31	0.95	0.40	0.53	.0	1.80
Very small seeds	+ 52	—16	1 58	0.17	1.28	.0	1.30
Small seeds	+ 74	—15	1.06	0.12	0.89	traces	4.43
Larger seeds	+ 98	+ 2	1.17	0.03	0.94	0.23	22.51
Ripe seeds	+128	+37	4.07	0.13	1.94	1.86	35.66

L. W. RIGGS

Excess soluble salts as the cause of vegetable diseases in greenhouses. S. D. CONNER AND C. T. GREGORY. *Proc. Indiana Acad. Sci.* **37**, 385–90(1927).—The percentages of sol. salts under thrifty lettuce in 7 greenhouses ranged from 0.10 to 0.25 at 3 in. below the surface. At 6 in. below the surface in 2 of these greenhouses the figures were 0.25 and 0.29%. Under stunted lettuce, but with no pathogenic disturbances, the percentages of sol. salts for 3 in. below the surface ranged from 0.26 to 0.97, and at 6 in. below the surface from 0.36 to 0.70. L. W. RIGGS

Hydrogen-ion studies of water, peat and soil, in relation to ecological problems at Bacon's swamp, Marion Co., Indiana. STANLEY A. CAIN. *Proc. Indiana Acad. Sci.* **37**, 395–401(1927).—In lowland forest alky. increased with the depth. Peat samples were all acid, those from the northern end being slightly acid and those from the southwest end reaching a p_H of 4.4. Soils can best be tested in the lab. because of the necessity of filtering, or better centrifuging, to give clear solns. for colorimetric readings. A series of 44 checks of the colorimetric method with the electrometric method gave an av. deviation of 0.061 p_H, showing the standard colorimetric method to be sufficiently accurate for this work. Water samples should be tested for p_H in the field, as they rapidly change in p_H because of the respiratory-photosynthetic relations of the microorganisms present in the water. Peat samples, even when extd., show very little change in p_H although allowed to stand for several days. This is evidently correlated with the relative absence of microörganisms. Different soils vary in this respect. In the hydrophytic assocns. there is a diurnal trend in p_H. The habitats are most acid in the morning and are less acid after the photosynthetic period. This trend is directly correlated with the respiratory-photosynthetic ratio. In both soil and aquatic habitats there seem to be certain p_H ranges within which the various assocns. are found. In most instances the different assocns. overlap so that little emphasis can be placed on acidity as a limiting factor in the vegetation present. L. W. RIGGS

Relation of lime to the absorption of iron by plants. WM. P. ALLYN. *Proc. Indiana Acad. Sci.* **37**, 405–9(1927).—Stalk tests indicate that the excessive use of $CaCO_3$ on soils does not render Fe unavailable for corn plant absorption. The application of lime increased the deposition of Fe at the nodes, especially where the soil had become neutral or slightly alk. The heavy deposits of Fe at the nodes of plants grown on heavily limed plots did not necessarily indicate that the total absorption of Fe was greater. The application of manure or potash decreases materially the amt. of Fe deposited at the nodes. The results of this study indicate that lime-induced chlorosis

is not a result of Fe becoming locked up in the soil, but rather the result of a disturbance in the metabolism of Fe after it had been absorbed by the plant. L. W. Riggs

Cell sap of Valonia and Halicystis. W. C. Cooper, Jr., and L. R. Blinks. Rockefeller Inst. *Science* 68, 164-5(1928).—Comparison between the saps of *Valonia ventricosa* of Florida and the Bermuda *Halicystis*, formerly known as *V. ventricosa*, showed a higher percentage of K in *V. ventricosa* than in *V. macrophysa*, while *Halicystis* contained less than $^1/_{30}$ of the K of *V. macrophysa*. L. W. Riggs

Mutations in barley induced by x-rays and radium. L. J. Stadler. *Science* 68, 186-7(1928).—Irradiation by x-rays or Ra of barley plants resulted in 48 mutations, out of 2817 head progenies, causing distinct seedling characters. These include nearly all of the seedling characters of barley already reported and several not previously described. No mutations were found in 1500 head progenies of untreated plants. L. W. Riggs

High and low frequency measurements with laminaria. L. R. Blinks. Rockefeller Inst. *Science* 68, 235(1928).—There is no change in the sp. cond. of either the inter- or intracellular material during treatment with $CaCl_2$ or NaCl, since the high frequency value remained const. The changes in impedance are not due to changes of capacitance since the latter would not affect the d. c. readings, which agree entirely with the 1000 cycle values. What capacitance there is has little effect on the impedance except at much higher frequencies. Changes in cross section may occur but are not sufficient to explain the results. The results of this study support the interpretation advanced by Osterhout that the observed resistance change is really a change in the permeability of protoplasm to ions. L. W. Riggs

Composition of the cell juices of Valonia macrophysa. Rudolf Höber and Josephine Höber. Zoöl. Station, Naples. *Arch. ges. Physiol.* (Pflüger's) 219, 260-72(1928).—Analyses of the cell juices of *Valonia macrophysa* show that *Valonia* is permeable for Cl, and probably for K also. Permeability is increased by caffeine, Ca and SO_4 entering less readily than K, the anion CN less readily than SO_4. A membrane may be impermeable to an electrolyte and still permeable to its ions. Sometimes the selective anion- and cation-permeable surface areas are both present. G. H. S.

The electrical conductivity of protoplasm. Samuel Gelfan. Univ. Calif. *Protoplasma* 4, 192-200(1928).—The sp. conductance of the protoplasm, apart from the cell membrane of *Amoeba proteus, Euplotes, Spirostomum teres, Frontonia*, of the plant cell *Nitella* and the starfish oögonia, has been detd. by means of nonpolarizable microelectrodes. The points of the electrodes were minute enough to penetrate the cells without greatly injuring them. The conds. of all these forms except the starfish eggs vary from one that is equiv. to a 0.01 *N* KCl soln. to one that is equiv. to a 0.06 *N* KCl soln. The av. is equiv. to about a 0.05 *N* KCl soln. The cond. of the starfish eggs is very high, equiv. to a 0.25 *N* KCl soln. It is pointed out that the conductance of the protoplasm is not affected by the viscosity. This and other evidence is advanced, pointing to a micellar structure of protoplasm. M. H. Soule

The effect of hydrogen-ion concentration upon the fixation image of various salts of chromium. Conway Zirkle. Bussey Inst., Harvard Univ. *Protoplasma* 4, 201-27 (1928).—The root tips of *Zea mays* were left in the fixatives from 36 to 40 hrs. and were then stained in Haidenhain's iron-alum hematoxylin. *Conclusions*.—The fixation image of a dichromate depends upon the p_H at which it is used. If the soln. is more acid than a given crit. point, the image will be practically that of chromic acid, *i. e.*, in resting cells the nucleolus will be a darkly staining globule in the center of a hollow nucleus whose periphery is formed by a chromatin reticulum. No mitochondria will be preserved and the cytoplasm will be disorganized. In dividing cells, the chromosomes and spindle fibers will be well fixed. If the soln. is on the alk. side of the crit. point, the fixation image will be quite different. In the resting stage the nucleolus is fixed as in the acid fixative, but here it appears in a solid nucleus composed of fixed nuclear lymph. The chromatin and spindle fibers will be dissolved so the tissue will show no mitotic figures. The mitochondria and cytoplasm will be well fixed. The change from one fixation image to the other is as a rule sudden and complete, the point of change depending upon the dichromate used and ranging among those investigated from p_H 4.2 in the case of ammonium to about p_H 5.2 in the case of Zn. After the change has taken place, a further change in p_H has little effect upon the fixation image. With an excess of the cation present as an oxide, hydroxide or carbonate, however, certain dichromates buffer at points where the 2 fixation images overlap. Thus Cu (p_H 4.6), Be (p_H 4.6) and Ce (p_H 4.8) dichromate fix nucleoli, nuclear lymph, dividing chromatin, spindle fibers, mitochondria and cytoplasm. The dichromates of Ba, Bi, Fe, Pb, Al and Hg are too acid to give any but the acid fixation image. Hg prevents the nucleolus

from staining with Haidenhain's hematoxylin. Ammonium (p_H 4.2), Na (p_H 4.4) and K (p_H 4.4) dichromate, in the absence of free chromic acid, give only the basic fixation image. Sr (p_H 5.6), Ca (p_H 5.6), Mg (p_H 6.2) and Cd (p_H 5.6) dichromate buffer at points where their fixation image is basic. Zn (p_H 5.2) gives a basic fixation image except that greatly swollen chromosomes are fixed at metaphase. A mixt. of $Ag_2Cr_2O_7$ and $(NH_4)_2Cr_2O_7$ (p_H 3.0) gives the usual acid fixation image and in addn. mitochondria in badly disorganized cytoplasm. $Li_2Cr_2O_7$ (p_H 4.6) gives the basic fixation image in the epidermal cells and somewhat disorganizes the interior layers; and in more basic soln. gives a fixation image which is as yet unique. Chromic sulfate buffered with CuO at p_H 4.6 gives an acid fixation image; with formalin added the p_H is not changed but the image becomes basic. Slight traces of the acetate ion will shift a basic fixation image to an acid one even if the p_H is held const. Such substances as acetates, NH_4 salts and formalin, which greatly alter the fixation image when mixed with Cr compds., probably do not participate directly in chrome fixation but, because of their ability to penetrate very rapidly, actually fix the tissue before the Cr reaches the scene of action, the Cr constituents serving merely for a post-chromatization. The form of the mitochondria depends upon the cation of the dichromate fixatives as well as that of the p_H. Fixed with $(NH_4)_2Cr_2O_7$ they are long slender threads occasionally forming a reticulum. $NaCr_2O_7$ and $K_2Cr_2O_7$ fix them as coarser threads and slender rods; Cu, Be and Ce as shorter, stouter rods; while with Li they fix as prolate spheroids. Zn, Cd and the alk. earths as cations tend to fix the mitochondria, especially in the region of elongation, as rods and chains of granules. $Cr_2(SO_4)_3$ and formalin fix them as slender threads. The findings are best explained by assuming that chrome fixation consists, first, of a double decompn in which the cation of the fixative unites with certain elements of the cell and the anion with others; second, followed by a reduction of part of the chromate to a chromic salt, the Cr then being combined with the tissue both as anion and cation. Chrome fixation can be considered a form of chrome tanning.

M. H. Soule

Studies in the biology of metals. I. The localization of lead by growing roots. Frederick S. Hammett. Lankenau Hosp., Philadelphia. *Protoplasma* **4**, 183–6 (1928).—White onion sets (*Allium cepa*), marrowfat beans (*Phaseolus vulgaris*) and field corn (*Zea mays*) were germinated in sterilized sphagnum moss to give rootlets of the desired length (*e g.*, 15–20 mm.). The plants were then transferred to perforated paraffin disks suspended in 250-cc. beakers of H_2O contg. approx. 0.05 g. of $Pb(NO_3)_2$. The Pb was absorbed by the actively growing roots and localized by deposition in the regions of growth by cell division. The deposit was some compd. of Pb. **II. The retardative influence of lead on root growth.** *Ibid* 187–91.—The Pb ion in concns. from 10^{-6} to 5×10^{-4} retards the root growth of seedlings. M. H. Soule

Electrical potential of plant tissue and single cells. J. Gicklhorn and Karl Umrath. German Univ., Prague. *Protoplasma* **4**, 228–58(1928).—A potentiometer system with microelectrodes is described. The app. was used to det. the potentials of the various tissues of *Hedira helix* and *Primula obconica*. The single cell *Amoeba terricola* was also investigated. M. H. Soule

Factors affecting the composition of dates. M. T. Fattah and W. V. Cruess. Fruit Products Lab., Univ. of California. *Plant Physiology* **2**, 349–55(1927); cf. *C. A.* 6, 519.—Analyses were made of Mesopotamia and California grown dates to ascertain the effect upon their compn. due to differences in variety and of the locality where grown, and also to det. chem. changes taking place during the ripening process. Owing probably to more favorable temps. during ripening, dates from Mesopotamia were higher in total sugars and lower in moisture than the same varieties grown in California. Different varieties exhibited marked differences in total sugar content, which in many cases could be attributed to arrested ripening by drying on the tree ("mummification"). The Deglet Noor variety was consistently high in sucrose; but most other varieties were low in this constituent when ripe. All unripe samples of all varieties examd. contained considerable sucrose; this decreased greatly during ripening except in the Deglet Noor variety. Sol. tannin decreased markedly during ripening under various exptl. conditions, such as incubation, dehydration, and during storage in various gases and vapors. Dehydration at 120° F. was the most satisfactory means of artificial ripening. Walter Thomas

The effect of ethylene on the respiration of bananas during ripening. L. O. Regeimbal, G. A. Vacha and R. B. Harvey. Univ. of Minn. *Plant Physiology* **2**, 357–9 (1927).—The fruit was placed in sealed glass vessels provided with inlet and exit tubes. Suitable wash bottles were inserted to free the incoming air from CO_2 and to keep the air satd. with vapor. The rate of CO_2 production was measured by means of a cond.

cell (*C. A.* 21, 3642) and the whole train of app. was kept in a const. temp. bath at 25°. The ethylene supplied in doses of 1:1000 of air by vol. was allowed to act for 15–20 min. and then aspiration was resumed. Cond. readings were taken every 15–30 min. for a period of 2 hrs. In all cases the rate of respiration trebled within a few min. and then fell off to a value lower than normal. This is attributed either to the increase of oxidation or to increase in the permeability of membranes, which would permit of the diffusion of the CO_2 already present in the cells. The stimulation wears off in less than 1 hr. The treated bananas have $^1/_5$ to $^1/_4$ more sugar than the untreated bananas, the starch content being proportionally decreased. The activity of the diastatic enzymes as well as the respiratory enzymes is increased by the treatments. W. T.

Pectin substances (SMOLENSKI, WLOSTOWSKA) 10.

HAAS, P., AND HILL, T. G.: **An Introduction to the Chemistry of Plant Products. Vol. I. On the Nature and Significance of the Commoner Organic Compounds of Plants.** 4th ed. London: Longmans, Green & Co. 530 pp. 18s.

E—NUTRITION

PHILIP B. HAWK

Vitamin-A deficiency and calcification of kidney epithelium. E. C. VAN LEERSUM. Nederlandsch Inst., Volksvoeding, Amsterdam. *Nederland. Tijdschr. Geneeskunde* 72, I, 3027–9(1928); cf. *C. A.* 22, 2187.—Rats fed on a diet deficient in vitamin A show a calcification of kidney epithelium. R. BEUTNER

The treatment of rickets with irradiated ergosterol (vitamin D.) J. C. SCHIPPERS. *Nederland. Tijdschr. Geneeskunde* 72, I, 3898–903(1928).—Favorable case reports in 16 cases. R. BEUTNER

Food value of the potato for white rats. A. GALAMINI. *Atti accad. Lincei* [6], 7, 684–9(1928).—The highly discordant results in the literature on the food value of the potato led to the present expts., in which white rats were fed only raw and cooked potatoes with NaCl added. The results show that even when eaten in large quantities potato is not a sufficient food either for the growth or for the maintenance of life of white rats. Growing rats died after having lost 27–9% of their wt. The loss of wt. was more rapid with raw potato than with cooked potato. A diet of raw or cooked potato for a long period resulted in alk. urine and other physiol. changes. Cooked potato increased the resistance to broncho-pulmonary diseases less than an adequate diet. C. C. DAVIS

Method of assay of the antirachitic vitamin D. KATHARINE H. COWARD. *Quart. J. Pharm.* 1, 27–33(1928).—A prepn. of irradiated ergosterol has been adopted by the Pharm. Soc. as a standard for the assay of the antirachitic vitamin. Its potency is such that a daily dose of not more than 0.0001 mg. will produce complete healing of rickets induced in rats under conditions described. It is proposed to define the unit of antirachitic potency as the amt. of activity contained in 0.0001 mg. of the standard. Details of a method of assay of any substance in terms of this standard are given. W. O. E.

The importance of vitamin A and vitamin C in the ration of swine concerning especially their effect on growth and reproduction. J. S. HUGHES, C. E. AUBEL AND H. F. LEINHARDT. Kan. Agr. Expt. Sta., *Tech. Bull.* 23, 1–48(1928).—The lack of vitamin A in the diet of pigs resulted in a degeneration of the nervous system, characterized in the advanced stages by striking nervous symptoms such as impaired vision, extreme incoördination and spasms. Histological examn. of the nerves so affected showed definite degeneration of the nerve bundles in the spinal cord, optic, sciatic and femoral nerves. Eye lesions are of minor importance in extreme avitaminosis A in swine. Gilts with avitaminosis A showed irregularity in the estrus cycle; it was usually more frequent and was of longer duration. Gilts bred prior to the onset of the nervous symptoms either aborted or farrowed dead pigs. Swine do not need vitamin C in their feed for growth or reproduction. The bibliography consists of 15 references. There are 20 carefully selected photographs and figures. C. R. F.

Antirachitic values of cod-liver oil, cod-liver meal and fish meal. H. O. STUART. N. H. Agr. Expt. Sta., *Circ.* 28 (1928).—With chickens as exptl. animals, vitamin D potency was detd. in these materials. In conjunction with the ration used 5% of fish meal prevented the development of rickets. Cod-liver oil and meal were approx. equal in relation to growth. The group having the highest feed consumption per individual produced the greatest gain. C. R. FELLERS

Polyneuritis in rats following shortage of vitamin B. ARTHUR SCHEUNERT AND

WOLFGANG LINDNER. *Krankheitsforsch.* **4**, 389–96(1927).—Observations upon white rats show that with very small quantities of vitamin B in the diet, just sufficient to provide for life, symptoms analogous to polyneuritis gallinarium are produced. This occurs only after long continued lack of vitamin B. P. Y. JACKSON

New pellagra-like deficiency symptoms in rats kept upon a vitamin-B-poor diet. ARTHUR SCHEUNERT AND WOLFGANG LINDNER. *Krankheitsforsch.* **5**, 268–72(1927).—The addn. of less than 30% wheat flour (60% milled) to a diet otherwise free of vitamin B caused after 50 days severe pellagra-like symptoms in white rats, especially in the extremities. With 40%, or 2 g., of wheat flour daily the animals remained normal. When fed upon a 94% milled flour the animals showed no symptoms of the disease. Less tendency to the disease was noted when increasing amts. of the outer part of the grain were fed. The addn. of 0.5 g. dry oats to the diet on two successive days was sufficient to halt the severest symptoms; and after a short time the addn. of this amt. of oats led to complete recovery. P. Y. JACKSON

Vitamin-B content of avocados. LEROY S. WEATHERBY AND EUGENE W. WATERMAN. Univ. So. Cal. *Ind. Eng. Chem.* **20**, 968–70(1928).—The vitamin B content was detd. through feeding expts. with albino rats. The pulp of fresh food was compared with Fleischmann's dry yeast as standard. The fresh pulp contained approx. $^1/_{12}$ the vitamin value of the dry yeast and apparently ranks high as a source of vitamin B. Both the antineuritic and growth-promoting factors are present. J. A. KENNEDY

Nutritive value of alba blood as a source of protein. SIGFRED M. HAUGE. Purdue Univ., Lafayette, Ind. *J. Assocn. Official Agr. Chem* **11**, 398–403(1928).—Alba blood is prepd. from spent printers' rolls (which are made from glycerol and gelatin) by eliminating as much glycerol as possible, dissolving the residue in H_2O and then drying. The product, which is used to increase the protein (N × 6.25) content of tankages, was tested for its biological value. It was found to be inadequate, both as the sole source of protein in the diet and as a supplement to corn. The addn. of a non-supplementing protein to the diet appears to have a repressing effect on growth, and the results indicate that alba blood should not be used to increase the protein content of tankage and meat by-products. A. PAPINEAU-COUTURE

Gelatin added to the diet of artificially fed infants. J. H. HESS AND I. MCK. CHAMBERLAIN. *J. Am. Med. Assocn.* **89**, 1423–6(1927); *Expt. Sta. Record* **58**, 292.—All feedings were made with fresh cow milk, approx. 2 oz. per lb. of body wt. per day, boiled water to make the total fluid intake 2.5 to 3.0 oz. and sucrose in amts. about 0.1 oz. per lb. of body wt. The mixts. were boiled 3 min. and given in 5 or 6 feedings daily. Cod-liver oil and orange juice were given daily. After a period of adjustment to this ration, the following changes were made: (1) Gelatin was added in amt. equiv. to 1% of the milk. (2) Raw egg yolk was added in amt. equiv. to the caloric value of the gelatin. Three of the infants received the gelatin-milk mixt. and 3 the egg yolk-milk mixt. during an exptl. period of 11 to 16 weeks; the 28 remaining infants received the 2 diets in alternating periods of 3 or 4 weeks each. No conclusions are drawn concerning the relative merits of the 2 types of feeding, but the figures appear to favor the egg yolk-milk mixt. L. W. RIGGS

The antirachitic activation of materials by ultra-violet rays. KÁROLY WALTNER. *Magyar Orvosi Arch.* **29**, 151–4(1928).—The results obtained with tyrosine are attributed to the presence of ergosterol as an impurity. Synthetic tyrosine cannot be activated. Vigantol (activated ergosterol) has a pronounced growth-producing influence on animals kept on diets low in Ca, and increases the serum Ca of the animals. L. W. RIGGS

Vitamin B terminology. R. ADAMS DUTCHER, *et al.* *Science* **68**, 206–9(1928).—The proposals for vitamin-B nomenclature, which have been received by the committee of the Am. Soc. Biol. Chem., are discussed in this paper. The final report of the committee awaits further study. L. W. RIGGS

Regulating the storage of vitamin A in animals that are to be used for the determination of this vitamin. E. M. NELSON. U. S. Dept. Agr. *Science* **68**, 212(1928).—Stock rats were bred when kept on a diet rich in vitamin A. Pregnant females were segregated. Litters of 6 animals were used and the no. of rats in a litter was reduced when necessary. Mothers were put on a diet free from vitamin A, some the day the young were born and others when the young were 5, 10, 15, 16, 17, 18, 19 and 20 days old. When the young had attained a wt. of 40 to 45 g. they were weaned and put on a diet lacking vitamin A. If the mother is deprived of vitamin A when the young are 16 to 18 days of age and weigh not less than 27 nor more than 30 g., and the young are weaned when they weigh from 40 to 45 g., the onset of symptoms of vitamin-A deficiency in the young seems to be independent of the amt. of vitamin A given the mother during the entire period of lactation, provided a certain min. level is not reached.

On such a ration, the exptl. animals have shown symptoms of vitamin-A starvation between the 5th and 6th week after weaning. Ophthalmia from vitamin-A deficiency seems to occur with the greatest degree of regularity in rapidly growing animals, and animals do not grow rapidly if the mother is put on a diet without vitamin A before the young are 15 days old. Onset of ophthalmia in rats deprived of vitamin A at the age of 19 days was slower than at an earlier age. Rats that weighed much more than 30 g. would eat the stock diet. L. W. RIGGS

Effect of ethylene upon the vitamin B content of celery. M. F. BABB. Univ. of Maine. *Science* **68**, 231(1928).—Expts. in feeding young rats with ethylene-blanched celery proved that the treatment of celery by C_2H_4 did not affect its vitamin B content. L. W. RIGGS

Tissue respiration of the liver during avitaminosis B. EISHICHIRO TSUKAMOTO. *Tohoku J. Exptl. Med.* **11**, 142–5(1928); cf. *C. A.* **20**, 2699.—Pigeons fed a diet of polished rice showed a decided fall in the O consumption of the liver. In the case of fasting pigeons the O consumption of the liver in cc. per g. per hr. was the same as in normal pigeons. L. W. RIGGS

The nutritive value of bread, with special reference to its content in vitamin B. W. CRAMER AND J. C. MOTTRAM. *Lancet* **1927**, II, 1090–4.—Confirming other observers, it was found that wheat germ is very rich in vitamin B and at least equal in potency to yeast. The various milling products of the wheat grain contain vitamin B in the following proportions: germ 100, middlings 50, bran 33, patent flour 0. The vitamin B content of different kinds of bread depends upon the milling products used in the making of the bread. Thus whole-meal bread and germ bread are very rich, while white bread made with yeast is poor in vitamin B. F. B. SEIBERT

Regulation of metabolism. X. Glycogen in fatty tissues and the possible transformation of fat into carbohydrate. ERNST WERTHEIMER. Univ. Halle a. S. *Arch. ges. Physiol.* (Pflüger's) **219**, 190–201(1928); cf. *C. A.* **21**, 2298.—With rats, first deprived of food and then abundantly fed, glycogen in considerable amts. (up to 2%) appears in the fatty tissues. Glycogen is also present in the fat of frogs in Oct. and Nov., and it persists even though they are starved or subjected to strychnine poisoning. There are many reasons for holding the view that fat can be transformed into carbohydrate. G. H. SMITH

Avitaminosis and the digestive organs. HENRY E. NEVER. Univ. Hamburg. *Arch. ges. Physiol.* (Pflüger's) **219**, 554–63(1928).—The secretory activity and acidity of the gastric juice are not abnormal in avitaminosis, but as the avitaminosis progresses the activity of the pepsin increases and the digestive glands tend to accumulate pepsin and trypsin or their precursors. There is a disturbance in absorption, and secretion, motility and appetite are but secondarily disturbed. G. H. SMITH

Exclusive milk and gelatinated milk diets. ANDREW NEFF. *Med. J. Record.* **128**, 67–8(1928).—The majority of 9 subjects drank milk, plain or gelatinated, for 1 month. This constituted their whole diet except for 0.5 g. fruit, which was taken daily. Each subject drank about 4 qts. milk per day. No definite advantage of either milk was observed, although the gelatinated milk was less constipating and had a higher food value because of the added protein. A positive N balance was found in all subjects following this routine, and their wts. increased or remained const. R. C. W.

Dietetic investigations of edible pure cellulose. J. W. FREY, E. R. HARDING AND T. R. HELMBOLD. Mellon Inst. *Med. J. Record* **127**, 585–9(1928).—Rats were selected as the exptl. animals because, being omnivorous, their diet is closer to that of man than other animals, as rabbits and guinea pigs, which normally live on a high-roughage diet. A basal diet of rolled oats 42, cracked corn 25, meat scrap 16, whole milk powder 12 and oil mixt. (salad oil 95%, cod-liver oil 5%) 5, was used. Small portions of liver and cabbage were given regularly to insure an adequate vitamin supply. The basal diet was decreased and cellulose prepns. were supplied to replace it. These preparations included, rice cellulose, cotton linters cellulose, diabetic flour, cellulosic rice flakes, bran cereal and agar-agar. The test was continued for three months, during which time all the animals showed splendid growth curves, in some cases better than the controls (100% basal diet). The amts. of cellulose substituted in the basal diet varied from 0.25 to 25%. The best results were obtained in the group in which 0.25% was used. Pathological examns. of the gastrointestinal tracts of the animals at the end of the test showed that pure cellulose in its preferred form is nonirritating and entirely harmless. R. C. WILSON

Decrease of resistance as a result of vitamin-D deficiency. W. EICHOLZ AND H. KREITMAIR. Chem. Lab. Fabrik E. Merck, Darmstadt, Germany. *Münch. med. Wochschr.* **75**, 79–81(1928).—Healthy full-grown rats (48) were placed on the Pappen-

heimer and Zucker rachitogenic diet consisting of meal 80.9, egg albumin 10.0, butter 5.0 and a salt mixt. which was low in P and high in Ca. The vitamin A content was enriched to prevent xerophthalmia. A daily dose of 0.0002 mg. irradiated ergosterol was given to 24 rats in addn. to the rachitogenic diet. Four weeks later 22 of the 24 rats were living, while only 4 of those on the basal diet remained. In another expt. 5 series of rats were fed on the following diets, resp.: normal diet (1), rachitogenic diet (2), this diet (2) and irradiated ergosterol (3), 2 plus yeast (4), and 2 plus ergosterol and yeast (5). The resistance, determined by the number of deaths in each series, decreased according to the diet in the following order: 5, 1 and 4 (same result), 3 and 2. It is concluded that dietetic deficiency in vitamin D effects a reduction in the natural immunity. Vitamin D plays a role as important in the maintenance or reproduction of the normal condition as that of vitamins A, B and C. Vitamin D is necessary to the growing organism for an undisturbed growth. R. C. Willson

Retention of the antiscorbutic vitamin after sterilization (Remy) 12. Oxidation of carbohydrates, fats and nitrogenous products by air in presence of sunlight (Palit, Dhar) 10.

Sansum, W. D.: **The Normal Diet.** 2nd ed., revised. St. Louis: C. V. Mosby Co. 136 pp. $1.50. Reviewed in *J. Chem. Education* **5**, 1200(1928).

F—PHYSIOLOGY

E. K. MARSHALL, JR.

The examination of the liver function by means of tetrachlorophenolphthalein injections and the influence of this substance on the liver. L. S. Hannema. Ziekenhuis aan den Coolsingel, Rotterdam. *Nederland. Tijdschr. Geneeskunde* **72**, I, 1059–70 (1928).—A criticism of Rosenthal's liver-function test (*C. A.* **17**, 588) and a comparison of this method with the bilirubin retention. A positive result of the diazo reaction, which indicates bilirubin retention, is invariably associated with a positive Rosenthal test. Slight deviations from the normal figures in the Rosenthal test are without importance because tetrachlorophenolphthalein damages also a normal liver, as found by H. R. Beutner

On the female sexual hormone, menformone, especially on menformone as the hormone causing the growth of the mammae. E. Borchardt, E. Dingemanse, S. E. de Jongh and E. Laqueur. Pharmaco-Therap. Inst., Amsterdam. *Nederland. Tijdschr. Geneeskunde* **72**, I, 2443–57(1928).—Menformone injections in rabbits and guinea pigs (80 and 400 mice units, resp., within 15 days) stimulate the growth of all sex organs. They also stimulate the growth of mammary glands in male guinea pigs and other animals. No other substance produces such actions. Menformone, present in the blood, is the cause of proliferation of the mammae, not only in adult women, but also, *e. g.*, in newborn children, and also in pathol. cases, as *e. g.*, trophoblast. The internal parts of the mammary gland are just as well over-developed under the influence of menformone. *By continuous injections of menformone, the authors have been able to produce a regular abundant milk production from a male guinea pig.* R. B.

The female sexual hormone (menformone), especially its anti-masculine action. E. Borchardt, E. Dingemanse, S. E. de Jongh and E. Laqueur. Pharmaco-Therap. Labor. Univ. Amsterdam. *Nederland. Tijdschr. Geneeskunde* **72**, I, 2866–82(1928).—Injections of menformone check the development of the male sexual organs and also the primary and secondary sexual characteristics. This arresting disappears entirely after discontinuing the menformone injections. Even in adult animals (rats, rabbits and guinea pigs were used), a considerable decrease of the sexual organs can be obtained by injecting high doses of menformone, *viz.*, 20 to 60 mice units daily. The lowest dose which has any effect is 1 unit daily. The "all or nothing" law does not hold in this case, even low doses showing some action; the action increases with the dose. Mammae and adrenals increase in size following menformone injections. R. Beutner

The oxygen capacity of human blood and its relation to the hemoglobin content by colorimetric and spectrophotometric methods. Masataka Ohno. *Z. ges. exptl. Med.* **53**, 82–90(1926).—The O capacity of Barcroft's micro method for capillary blood in 10 healthy individuals varied between 18.19 and 21.96 cc. vol. %, the av. being 19.81%. The O capacity was proportional to the hemoglobin content, the factor being 1.324 cc. O per g. hemoglobin. The av. values for hemoglobin content per 100 cc. blood were 14.79 g. by Barcroft's O-capacity method, 15.08 by Burker's colorimetric method (*C. A.* **18**, 2354), and 14.83 by the use of the Hüfner spectrophotometer (*Z. physiol. Chem.* **1**, 317(1877)). Bibliography. F. L. Dunn

Metabolism in dogs following liver extirpation. V. M. Vesselkina. Lesshaft Institut, Leningrad. *Z. ges. exptl. Med.* **55**, 198–213(1927).—The Eck fistula was formed and the extirpation was made at one operation. The urinary excretion following the operation until the death of the animal was studied. There was a diminution in secretion of urine, which was not associated with an albuminura. The urine was more acid, the ammonia, amino acid N, uric acid and purines were increased. There was an increase in the purine metabolism though the mechanism for this increase was not clear. F. L. Dunn

Influence of the thyroid hormone on protein metabolism. L. Lichtwitz and L. Conitzer. Krankenhause Altona a. Elbe. *Z. ges. exptl. Med.* **56**, 527–34(1927).—L. and C. studied the effect of thyroidin on the protein metabolism of a case of myxedema. Thyroidin produced a negative N balance and the ratio of protein loss to weight loss was 2.3:100 for the entire period though this ratio was variable for shorter periods (cf. Boothby, Sandiford, Sandiford and Slosse, *C. A.* **20**, 447). The negative nitrogen balance paralleled the lowering of plasma protein. F. L. Dunn

Experimental studies with the parathyroid hormone in white mice. Heinrich Süssmann. Univ. zu Kiel. *Z. ges. exptl. Med.* **56**, 817–30(1927).—No relationship was found between the toxicity of guanidine and the injection of parathyroid hormone. The blood Ca was not raised in rats on injecting parathyroid hormone. The action of strychnine and picrotoxin was not affected. F. L. Dunn

Phosphates in blood and the urinary excretion of phosphates. R. T. Brain, H. D. Kay and P. G. Marshall. London Hospital. *Biochem. J.* **22**, 628–48(1928).—In normal plasma the P is present in two forms: (*a*) the major portion, inorg., largely dialyzable, (*b*) about 10% as organically combined P. Taking phosphoric esters by mouth does not increase the concn. of ester P in the plasma; but the latter can be raised temporarily by intravenous injection of phosphoric esters. In the human subject and rabbit the source of inorg. phosphate in the urine is not the org. but the inorg. P of the plasma. There appears to be a renal threshhold for phosphate excretion. There is no relationship between the amt. of urinary phosphate and the urinary vol. Benjamin Harrow

Work on the basophilic substance in youthful red corpuscles. II. The physicochemical properties of the basophilic substances in the new erythrocytes. H. Brückner. *Arch. Hyg.* **98**, 95–107(1927).—In a moist smear of the blood of a lead-poisoned guinea pig the action of the usual fixing media, such as alcs., is to dehydrate and deform the erythrocytes; those erythrocytes which contain the basophilic substance show a polychromatic flocculation with the alcs.; and a regular granular form when they are treated with the vapor of osmic acid or with powdered dyes. Temps. of 60–100° cause the basophilic substance in the moist smear to assume the polychromatic flocculated form. With lower temps. a larger proportion of the granulated form appears. The ratio of the polychromatic to the basophile-dotted erythrocytes is a function of the temp. and of the rate of evapn of the water from the cells. Air-drying is only one method for the coagulation of the basophilic substance. The polychromatic, basophile-dotted, and vital-granulated forms all consist of the same chem. substance. In the circulating blood or in the bone marrow the basophilic substance is apparently in a solvated form. The substance can be observed microscopically only as the result of changes artificially produced. P. Y. Jackson

Respiratory metabolism in infancy and in childhood. VII. Elimination of water through the skin and respiratory passages of infants. Samuel Z. Levine and James R. Wilson. Cornell Univ. Med. College and N. Y. Nursery and Child's Hospital. *Am. J. Diseases Children* **35**, 54–60(1928).—Infants, as well as children and adults, lose approx. 75% of the heat produced by their metabolic processes by radiation and conduction, and the remaining 25% by means of vaporization of water from the skin and lungs. E. R. Main

Escape of hydrocyanic acid from the blood. E. Kohn-Abrest and Lupu. *Compt. rend.* **187**, 362–4(1928).—The escape of HCN and cyanides from the organism remains imperfectly understood. Transformation of HCN to HCO_2NH_4 and to thiocyanate may account in part for the disappearance of HCN. In order to det. the part played by the normal glucose of the blood in the disappearance of HCN from the organism, hog blood which initially contained no reducing sugar was studied as follows: Four prepns. of the blood were made and each was treated with 24 mg. of HCN. Prepn. (*A*) consisted of 200 cc. of serum without glucose, (*B*) 200 cc. of serum with the addn. of 0.3 g. of glucose, (*C*) 200 cc. of blood contg. 2% of borate without glucose, and (*D*) 200 cc. of blood with 2% borate and 0.3 g. of glucose. Each of the four 200-cc. portions was divided into 25-cc. portions in stoppered tubes. Half of these tubes were allowed

to stand at 20° and the other half at 37° for several days. The HCN was detd. by distn. in the presence of H_3PO_4 and titration with $AgNO_3$. At 20° there was no loss of HCN in 2 days from (*A*), 31.0% loss from (*B*), 7.3% from (*C*) and 14.4% from (*D*). At 37° the corresponding figures were 17.2, 68.3, 7.2 and 31.3. For 7 days at 20° the losses were 0.0, 70.1, 10.8 and 21.1%, and at 37° the corresponding figures were 17.1, 88.5, 26.2 and 82.7%. These results afford a partial explanation for the absence of HCN from the blood of victims of HCN poisoning. L. W. Riggs

Regulation of insulin production. II. Effect of carbohydrates other than glucose. E. Grafe and F. Meythaler. Univ. Würzburg. *Arch. exptl. Path. Pharm.* **131,** 80-91(1928); cf. *C. A.* **22,** 251.—The hormonal action of glucose is not to be ascribed to its distinctive chem. or physico-chem. properties, since it is exhibited by all carbohydrates independently of their optical activity, provided they are reducing or yield reducing substances in the tissues. G. H. S.

Clinical significance of cholesterol in the bile and in blood serum. IV. Experimentally induced changes in the cholesterol concentration and in the p_H of fistula bile. Rudolf Stern. Univ. Breslau. *Arch. exptl. Path. Pharm.* **131,** 221-32(1928); cf. *C. A.* **21,** 448.—There is no direct relationship between the blood cholesterol and the amt. excreted in the bile. There is no reason for thinking that by administration of acid or cholesterol a coagulation of cholesterol can be evidenced to a degree adequate to cause the formation of gall stones. G. H. S.

Respiratory function of the blood at high altitudes. Hans Winterstein and Klothilde Gollwitzer-Meier. *Arch. ges. Physiol.* (Pflüger's) **219,** 202-12(1928).—At high altitudes the alkali reserve of the venous blood from the brain is lower than that of the arterial blood. The difference in p_H of the bloods is also greater than normal. G. H. S.

Effect of the circulation and of the extramural autonomic nervous system upon absorption from the intestine. I. W. Borchardt. *Arch. ges. Physiol.* (Pflüger's) **219,** 213-26(1928). G. H. S.

Is the concentration of blood pigment in the blood corpuscles constant in all animals? L. Drastich. Masarykova Univ., Brno. *Arch. ges Physiol.* (Pflüger's) **219,** 227-32 (1928); cf *C. A.* **22,** 1617.—The hemoglobin concn. is the same for the blood cells of all species (mammals) examd., the value being about 31.7 g. of hemoglobin per 100 cc. of blood. G. H. S.

Glycogen content of the stimulus-conducting system of the heart. S. Buadze and E. Wertheimer. Univ. Halle a. S. *Arch. ges. Physiol.* (Pflüger's) **219,** 233-37 (1928).—There is some 7 times as much glycogen in heart muscle as in the conduction system. The O_2 utilization is also lower than that of the muscle. G. H. S.

Point of formation and fate of urea in dogs, and the relation between urea formation and the retention of amino acid substances and of ammonia in the liver, determined by the method of angiostomy. E. S. London, N. Kochneva, A. Cholopov, T. S. Abaschidze and A. K. Alexandry. Inst. Exptl. Med., Leningrad. *Arch. ges. Physiol.* (Pflüger's) **219,** 238-45(1928).—The liver elaborates urea continuously, although during digestive periods the output is about 2$^1/_2$ times that of the intervals between gastric activity. In addn. to the removal by the kidney, the intestinal wall withdraws urea from the blood. In most of the other organs there is somewhat more urea in the venous than in the arterial blood, but with spleen and muscle this difference is extremely small. The formation of urea in the liver is not a simple transformation of definite substances into urea, but should be considered rather as a process of internal secretion. Certain of the amino acids, such as arginine and tyrosine, seem to inhibit urea formation, cystine increases it little, if any, and alanine and cysteine are stimulating. Peptone exerts no influence. G. H. S.

Hormone of heart activity. IX. Extracts of mammalian heart. L. Haberlandt. Univ. Innsbruck. *Arch. ges. Physiol.* (Pflüger's) **219,** 279-85(1928); cf. *C. A.* **22,** 1787-8.—Exts. of beef heart, in dilns. of 1:1000, exert an inciting, strengthening, and regulating action on both the isolated ventricle and the intact frog heart. Such exts. will lead to a weak pulsation in hearts completely arrested 2-4 days after their removal from the body. They cause vasodilatation and sensitize the ventricle to adrenaline. G. H. S.

Mechanism of the second phase of gastric secretion. I. P. Rasenkov. Inst. Exp. Med., Leningrad. *Arch. ges. Physiol.* (Pflüger's) **219,** 391-401(1928).—Blood withdrawn from an animal at the moment of max. gastric secretion (induced by various chem. stimulants) causes a gastric secretion when intravenously injected into other animals. Chem. stimulants, such as Liebig's ext., cause a more marked secretory activity in the stomach when injected into the circulation than when introduced into

the stomach. Subcutaneous injections are even more effective than intravenous. The mechanism of the second phase of gastric secretion is purely chem. G. H. S.

Origin and fate of uric acid and the absorption of nucleic acid in dogs, as determined by the method of angiostomy. S. I. RABINOVICH. Inst. Exp. Med., Lenigrad. *Arch. ges. Physiol.* (Pflüger's) **219**, 402–6(1928).—Nuclein substances enter the portal vein from the intestine as soon as the simple nucleotide complex is formed, and during the second hr. of digestion they reach a concn. of 1.3 mg % in the portal vein. This concn. gradually falls; after 3 hrs. it is 0.6 mg. %; after 4.5 hrs., 0.1 mg. %. Purines are also absorbed. The absorbed derivs. of nucleic acid become distributed to the organs, without being retained by the liver, and transformed to uric acid. During digestion the blood of all veins, both peripheral and deep, with the exception of those of the liver and kidney, contains more uric acid than does the arterial blood. The portal vein shows the greatest increase in uric acid (0.33 mg. %), while the greatest loss occurs in the veins of the liver. G. H. S.

Structure of the membrane of red blood cells. Relation between permeability and molecular volume. RUDOLF MOND AND FRIEDRICH HOFFMANN. Univ. Kiel. *Arch. ges. Physiol.* (Pflüger's) **219**, 467–80(1928).—The degree of permeability of red blood cells for non-lipoid-sol. substances parallels their mol. vol. The facts observed lead to the assumption that in the cell, protein and lipoid phases are resident on the surface in a stroma network, the protein phase possessing pores of definite size through which ions and non-lipoid-sol. substances, if not of too large a mol. vol., may pass. Probably the lipoid phase contains no pores. G. H. S.

Connection between blood-sugar content and blood-coagulation time. II. ALEXANDER PARTOS AND FRANC SVEC. *Arch. ges. Physiol.* (Pflüger's) **219**, 481–4(1928); cf. *C. A.* **22**, 2606.—The power of organ exts. to hasten coagulation persists after the protein and peptone have been removed, and is due to the creatine, creatinine, and lactic acid present. G. H. S.

Relation between the secretory and motor activity of the stomach. E. I. SINELNIKOV AND M. E. GREDIG. *Arch. ges. Physiol.* (Pflüger's) **219**, 485–99(1928).—When an intensive secretion of gastric juice is induced by false feeding the motility of the stomach is inhibited, the duration of the inhibition (av. 1$^1/_2$ hrs.) depending upon the degree of secretory activity. When the secretion of juice diminishes "acid motility" develops, and as secretion stops the "acid motility" gives place either to "hunger motility" or to a complete loss of both glandular and muscular activity. Teasing the animal with meat leads to a similar sequence of events, although the period of inhibition of gastric motility is shorter (20–30 sec.). During the periodic activity of the stomach hunger motility parallels mucous secretion An antagonism is exhibited between secretion of gastric juice and hunger motility, and "psychic" secretion of juice is also inhibitory. G. H. S.

Heat production of skeletal muscle under direct and indirect stimulation, as well as in reflex contraction. ERNST FISCHER. *Arch. ges. Physiol.* (Pflüger's) **219**, 514–53 (1928).—Thermoelec. detns. are made in frogs. G. H. S.

Effect of vagal stimulation upon the coagulation time of the blood. F. PLATTNER AND Y. KODERA. Univ. Innsbruck. *Arch. ges. Physiol.* (Pflüger's) **219**, 564–71(1928). —The coagulation time of the blood of dogs, cats and rabbits was definitely lengthened following stimulation of the vagus. Stimulation of the splanchnic shortens coagulation time. G. H. S.

Can a formation of vagus or accelerans substance of non-nervous origin be observed in the frog heart? HERMANN STEFAN. Univ. Innsbruck. *Arch. ges. Physiol.* (Pflüger's) **219**, 572–6(1928).—If the action of the vagus substance on the heart is abolished by atropine, or the effect of the accelerans substance is removed by ergotamine, the application of heat stimulates the rate just as in normal hearts. G. H. S.

Does blood and serum contain a substance protecting against the results of parathyroidectomy? Reply to Isidor Greenwald. F. BLUM. *Arch. ges. Physiol.* (Pflüger's) **219**, 577–8(1928); cf. *C. A.* **22**, 1800.—It does not. G. H. S.

Effect of thyroxine on the body and particularly upon heat regulation of mammals. EMIL ABDERHALDEN AND ERNST WERTHEIMER. Univ. Halle a. S. *Arch. ges. Physiol.* (Pflüger's) **219**, 588–608(1928).—Although dogs, rabbits, and guinea pigs promptly suffer a loss in wt. when given thyroxine, and die if repeatedly injected, rats and mice are decidedly more resistant. In all species the glycogen, particularly that of the liver, is reduced. Thyroxine is more active than 3,5-diiodotyrosine. Tadpoles and the water form of axolotl are much more susceptible to thyroxine than are frogs and the land form of axolotl. Thyroxine and 3,5-diiodotyrosine modify the effect of adrenaline

on heart muscle in exactly opposite ways, thyroxine being inhibitory. In concns. between 1:6000 and 1:10,000 thyroxine reduces for a time the amplitude of contraction of the heart without changing its rate. Rats treated with thyroxine are more sensitive than are normal rats to increased external temp., their body temp. responding promptly. With the development of a high temp. death quickly takes place and the carbohydrate reserves of the liver become exhausted. The blood sugar falls and CO_2 production is increased. Thyroxine-treated mice did not bear young as did the controls. G. H. S.

Increase in the capillary active substances of the blood after stimulation of the vagus. F. PLATTNER AND O. GALEHR. Univ. Innsbruck. *Arch. ges. Physiol.* (Pflüger's) **219,** 609–12(1928).—Stimulation of the vagus causes a reduction in the surface tension of the serum, according to Brinkman, but this could not be confirmed; hence the conclusion that the vagus substance and acetylcholine (which does not alter surface tension) are different is not necessarily valid. G. H. S.

Behavior of different organs with regard to cholesterol, fat and the lecithins, as determined by the angiostomy method in dogs. S. V. NEDSVEDSKII AND A. K. ALEXANDRII. Inst. Exp. Med. Leningrad. *Arch. ges. Physiol.* (Pflüger's) **219,** 619–25 (1928).—With the majority of organs the blood entering and leaving the organ contains the same amt. of cholesterol and fatty acids, but in the fasting animal the adrenal shows a distinctive behavior as regards cholesterol, as does the spleen for fatty acids. The adrenal excretes 8 mg. of cholesterol per 100 cc. of blood; the spleen retains about 7 mg. of fatty acids per 100 cc. of blood. During digestion the situation in both organs becomes changed, the adrenal retaining cholesterol. The kidney does not absorb fat, and while the other organs retain some fat the pancreas is most active in this respect. The arterial blood contains the same quantity of lecithin in both the fasting condition and during digestion, about 2.6 mg. per 100 cc. The venous blood of the liver contains the greatest quantity of lecithin, indicating the liver as the point of formation. The organs retain lecithin to various degrees, the intestinal wall being most active in this respect. G. H. S.

The estrum in rats and the effect upon it of ovarian extracts and bile. M. A. GSELL-BUSSE. *Arch. ges. Physiol.* (Pflüger's) **219,** 626–46(1928).—The active hormone of ovarian ext. is both lipoid- and water-sol. Na taurocholate contains an active principle which acts like an ovarian hormone. G. H. S.

Fate of acetylcholine in the blood. IV. Dependence of acetylcholine destruction upon the hydrogen-ion concentration. F. PLATTNER, O. GALEHR AND Y. KODERA. Univ. Innsbruck. *Arch. ges. Physiol.* (Pflüger's) **219,** 678–85(1928); cf. *C. A.* **22,** 3896.—As serum or blood cell suspensions become more acid the breaking down of acetylcholine becomes less rapid. **V. Influence of gum arabic and starch upon the splitting.** Y. KODERA. *Ibid* 686–93.—In human serum gum arabic and sol. starch reduce the breaking down of acetylcholine. At a given viscosity the inhibitory influence of both substances is about the same. The interference exercised by gum arabic when the acetylcholine is in a blood corpuscle suspension is less than in serum, and in cell suspensions starch fails to inhibit. G. H. S.

Formation of urine in the frog kidney. XIV. Relation of amino acids to the activity of the kidney. GIORGY WATZADSE. Univ. Kiel. *Arch. ges. Physiol.* (Pflüger's) **219,** 694–705(1928).—In the artificially perfused frog kidney the addn. of glycocoll favors perfusion and urine secretion. A lack of glycocoll is more outspoken on the arterial than on the venous system. Substances with an amino group act as does glycocoll, while other N-contg. compds. such as creatine, creatinine, lactamid, ethylamine hydrochloride, hippuric acid, etc., fail to stimulate. The vessels of the intestine, and the vessels of the liver to a less degree, are susceptible to glycocoll as are those of the kidney. G. H. S.

Biometry of calcium, inorganic phosphorus, cholesterol and lipoid phosphorus in the blood of rabbits. I. Normal rabbits from recently acquired stock. ALVIN R. HARNES. Rockefeller Inst. for Medical Research. *J. Exptl. Med.* **48,** 549–65(1928). —Detns. of Ca, inorg. P, cholesterol and lipoid P were made on a series of animals recently received from the dealer for the purpose of detg. the trends of these 4 blood constituents throughout the year with the degree of their respective variations and math. correlation. For the 80 animals examd., Ca varied from 14.5 ± 0.10 to 18.5 ± 0.39 mg. and inorg. P from 4.960 ± 0.20 to 6.820 ± 0.20 mg. per 100 cc. of blood serum. Cholesterol varied from 51.1 ± 1.18 to 83.3 ± 1.34 mg. and lecithin from 94.8 ± 1.397 to 108.3 ± 10.18 mg. per 100 cc. of whole blood. Of the 6 possible combinations in calcg. the coeff. of correlation for the trend throughout the expt., 3 stand out as of math. significance: between inorg. P and lecithin the coeff. of correlation was —0.794 ±

0.088; between Ca and cholesterol —0.887 ± 0.051 and between cholesterol and lecithin 0.560 ± 0.164. C. J. West

The effect of calcium on fertility and pregnancy. Oscar Loew. *Med. J. and Record* **127,** 35–6(1928).—White mice in the proportion of 1 male to 7 females, none of the animals having reached sexual maturity, were fed on crushed Indian corn, oats and bread which had been soaked in a Ca salt soln. in a proportion of about 0.1 g. $CaCl_2$ per kg. of animal's weight. Control animals received distd. H_2O in the same proportion on their bread. In 7 months those which had received $CaCl_2$ produced 43 litters with 262 young; those which received NaCl had 33 litters with 179 young, while the controls had 23 litters and 115 young. In another series (1 male to 8 females) those receiving $CaCl_2$ had 51 litters and 297 young while those to which KCl had been fed had only 19 litters and 93 young. This depressing effect of KCl was checked in another series. In 147 days guinea pigs (6 females to 1 male) dropped 11 litters and 33 young when fed with $CaCl_2$, 8 litters and 19 young on NaCl, 6 litters and 15 young on KCl and 6 litters and 16 young on distd. H_2O (controls). Rabbits (2:1) at the end of 163 days when fed with $CaCl_2$ had 14 litters and 66 young, while the controls dropped 10 litters with 41 young. Ca lactate has been found to be the more suitable form in which to administer Ca to man. Ca retention can be secured only by a favorable degree of blood alkalinity which Na lactate produces, so the double salt Ca-Na-lactate is the best form. R. C. Willson

Latest conception of the functions of the liver and some of the most important tests. Julius Schneyer. *Med. J. & Record* **127,** 302–6(1928).—Technic of the following tests is given in full: galactose test, Ehrlich's aldehyde test, quantitative analysis for urobilinogen and water test in liver diseases. It is concluded that the liver does not produce, but secretes bile. Bilirubin and biliverdin are produced by the Kupfer cells of the reticuloendothelial system. They are produced by the elimination of globulin and hemosiderin from hemoglobin. Urobilinogen is produced from bilirubin by the loss of 1 mol. O and gaining 1 mol. H. R. C. Willson

G—PATHOLOGY

H. GIDEON WELLS

Concentration ratio of aromatic substances between serum and urine in renal health and disease. E. Becher, S. Litzner and F. Doenecke. *Münch. med. Wochschr.* **74,** 1656–7(1927).—Normally the concn. ratio for phenols and indican between the urine and serum is greater than that for N. The ratio falls in renal insufficiency to a greater extent than does that of urea. For indican the serum value may be higher than the urine value. B. C. A.

Variation of protein in blood serum in acute infection. A. Schoch. *Schweiz. med. Wochschr.* **56,** 1017–22(1926).—In pneumonia the serum-protein at first diminishes, and is later increased. The methods of Reiss, Robertson, Nägeli and Rohrer and Kjeldahl are compared. B. C. A.

Pathogenesis of edema following acute poisoning with uranium. Paul Govaerts. *Bull. acad. roy. med. Belg.* [5], **8,** 33–45(1928); cf. *C. A.* **22,** 1386.—Rabbits are poisoned by U(1 cc. of a 0.7% soln. injected daily) and receive by mouth 100 cc. H_2O or saline soln. Serous effusions appear, particularly in those animals which have ingested saline. The serous fluid is rich in proteins, contg. even fibrinogen. The accumulation of fluid is due to diminished osmotic pressure of the blood proteins, and an increased permeability of the capillary membranes, moreover to the arresting of diuresis. R. B.

Determining the prognosis of tuberculosis by means of a physicochemical examination of the blood serum. F. L. Oudendal. Amsterdamsch Sanatorium Hoog-Laren. *Nederland. Tijdschr. Geneeskunde* **72,** I, 3429–57, 3549–63(1928).—O. disproves Naegeli's statement that the quotient of the refractory index : viscosity is detd. by the relative concn. of albumin and globulin (*Deut. Arch. klin. Med* **120**). The detn. of albumin and globulin is most accurately made by a micro-Kjeldahl app. or by the nephelometer. However, serum globulin is not increased in active tuberculosis and the detn. of the sp. viscosity according to Spiro (*Arch. exptl. path. Pharm.* **100**(1923); cf. *C. A.* **17,** 1506) affords the best method of estg. the degree of activity of the tuberculous process. R. Beutner

Serum protein picture as a guiding principle in therapeutic investigations of epilepsy. Felix Frisch. *Wiener klin. Wochschr.* **41,** 838–43(1928).—In epilepsy serum protein is about 1/5 higher than normal. The increase is usually entirely in serum albumin. Observations were made on the albumin-globulin ratio in starvation and following immunization. D. B. Dill

Swelling pressure in the blood. F. Högler, A. Thomann and K. Überrack. Kaiserin Elisabethspital, Wien. *Wiener klin. Wochschr.* **41,** 949–51(1928).—The swelling of erythrocytes in NaCl and in glucose solns. is not a function of osmotic pressure alone. Normal erythrocytes remained unchanged in vol. in 8 to 9% glucose while in many pathol. cases the so-called isotonic range was 6 to 8% and in animals, 4 to 5.5%. Yet the concn. of NaCl which produced no swelling was approx. 1.0 to 1.1% for all these bloods examd., excepting that of the fish. D. B. Dill

Physicochemical studies of pathologic blood serum. I. M. Goldberg. Univ. Baku. *Z. ges. exptl. Med.* **53,** 867–77(1927).—G. added 1 cc. of serum diluted 1:10 to 1:100 to a series of lactic acid buffers made up by adding 0.1 to 1.0 cc. of a 0.01 *N* lactic acid soln. and adding water to 1 cc. After 18 hrs. the pptn. zone was detd. With a 1:20 diln. of serum a max. pptn. was obtained between 0.3 and 0.4 cc. 0.01 *N* lactic acid. 116 pathologic cases were studied and showed deviation in max. pptn. in both directions. Immunization in rabbits did not change the zone of max. pptn. In anaphylactic shock the zone of pptn. was widened. F. L. Dunn

Experimental hyperglucemia in fever. Hans Cohn. Stadt Krankenhaus Berlin-Neukölln. *Z. ges. exptl. Med.* **53,** 878–82(1927).—In rabbits with fever produced by the injection of a killed *B. coli* culture and with β-tetrahydronaphthylamine, the peroral administration of glucose did not produce hyperglucemia. The same was observed in febrile humans beings. C. suggests that the elevated metabolism and the rapid utilization of carbohydrate prevented the hyperglucemia. F. L. Dunn

Anaphylaxis studies in man and animals. VI. The protein metabolism during anaphylaxis in rabbits and dogs. A. Schittenhelm and W. Erhardt. Medizinischen Klinik, Kiel. *Z. ges. exptl. Med.* **56,** 511–7(1927); cf. *C. A.* **20,** 3034; **22,** 2782.—No significant changes in total nitrogen, rest N, and sol. N were found in the liver, lung, spleen and intestine, of dogs and rabbits following anaphylaxis. Sensitized rabbits showed a small increase in the total N of the blood. Following anaphylaxis this decreased but the rest N increased. A study of the enzymes in the organs showed no definite changes. F. L. Dunn

Investigations with alcohol-precipitable horse-flesh albumin as precipitinogen. Ch. Schweizer. Bern Board of Health. *Mitt. Lebensm. Hyg* **17,** 263–7(1926); *Chem. Zentr.* **1928,** I, 1303.—The author produces an antiserum of a relatively low activity, but which makes the animal peculiarly sensitive to the production of a highly potent antiserum, if the animal is previously treated by injecting normal horse blood serum. Russell C. Erb

An investigation of metabolism in dystrophia adiposo-genitalis. W. Nonnenbruch. *Deut. Arch. klin. Med.* **156,** 312–20(1927).—A case of dystrophia adiposogenitalis with tumor of the hypophysis showed basal metabolism lowered by 24%. After ingestion of 200 g. meat, the metabolic rate was increased after 1–2 hrs. by only 10–12% but the max. increase, 32%, was reached only after 4 hrs. A single detn. is not sufficient to det. the true sp. dynamic effect. This observation conflicts with the assumption that the sp. dynamic action of protein is a function of the anterior lobe of the hypophysis. P. Y. Jackson

The influence of suggestion upon heat regulation in hypnosis. H. Gessler and K. Hansen. *Deut. Arch. klin. Med.* **156,** 352–9(1927).—Without hypnosis the exptl. person was first exposed to a temp. of 16–18°; an increase in O_2 consumption was noted which amounted to 10–23% above that observed at room temp. With hypnosis but with no further suggestion, a decrease in external temp. caused a somewhat smaller increase in the rate of O_2 consumption; the effect here is analogous to that of sleep. Exposure to reduced temps. and simultaneous hypnotic suggestion of warmth produced no increase in the rate of O_2 consumption, or else a very slight increase. Exposure to a temp. of 13.2°, accompanied by the hypnotic suggestion of cold, caused the rate of O_2 consumption to be increased as much as 41%; suggestion of cold, while the person was warmly covered, increased the rate 29%; the hypnotic suggestion of cold produced gooseflesh and shivering. P. Y. Jackson

Changes in human blood serum which accompany the treatment of cardiac edema. Karl Recknagel. *Deut. Arch. klin. Med.* **156,** 360–71(1927).—In all observed cases of cardiac edema normal concns. of serum protein, detd. refractometrically, and by the methods of Kjeldahl and of Robertson, were found at the beginning of the treatment. Administration of strophanthin was followed by diuresis and a decrease in protein concn. After a few days the protein concn. increased rapidly and sometimes exceeded 9.6 g. %; and then fell off again to normal values. At the same time the albumin-globulin ratio was almost const., except where there were complicating infections; and the viscosity curve in these cases resembled the curve for globulin concn. The

NaCl concn., which was normal at first, had a tendency to decrease at the beginning of the treatment; after most of the edema-liquid had been expelled through the kidneys there was in all cases a rise in NaCl concn. to abnormally high values. Apparently much NaCl was removed from the tissues by the diuresis, with the production of a hyperchloremia. P. Y. Jackson

The recognition of chylothorax. R. Schaefer. *Deut. Arch. klin. Med.* **157**, 69–75(1927).—Chem. analysis of the liquid obtained by puncture of the thorax distinguishes true chylosis, in which chyle is found, from conditions in which the liquid is milky (from fat) or opalescent (from protein). A case is described in which true chylothorax resulted from a severe fall. P. Y. Jackson

The course of variations produced in the urine by disturbance of the gastric secretions. L. Hermanns and J. Salachow. *Deut. Arch. klin. Med.* **157**, 98–107(1927).—The p_H and NH_3 of the urine were detd. in hyper-, iso-, and hypoacidity of the gastric juice; and the effect of a test meal consisting of meat, vegetables, carbohydrates, or fats. Two distinct types of variations were observed. In hyperacidity a max. p_H in the urine accompanied a min. NH_3 in 1–3 hrs. In isoacidity on the other hand a rise in NH_3 was observed with a corresponding fall in p_H. P. Y. Jackson

The lactic acid content of the blood in disease of the liver. A. Adler and H. Lange. *Deut. Arch. klin. Med.* **157**, 129–42(1927).—In acute atrophy of the liver the lactic acid content of the blood varied between 40 and 90 mg. % as compared with a normal 7–13 mg. %; the concn. of lactic acid is higher with increasing severity of the condition. In cirrhosis of the liver and in hemolytic icterus there was a smaller increase in the concn. of lactic acid. Usually the higher concn. of lactic acid was accompanied by a decrease in the cholesterol of the blood. For the differential diagnosis of mech. and nonmech. icterus, an increase in lactic acid indicates the decompn. of liver cells. Following the injection into the blood of Na lactate, the concn. of lactic acid falls more slowly in those cases where the liver is diseased. P. Y. Jackson

The detection of homogentisinic acid in the serum of an alcaptonuric subject. G. Katsch and E. Metz. *Deut. Arch. klin. Med.* **157**, 143–57(1927).—The usual tests for homogentisinic acid in the urine are not delicate enough to detect certainly the smaller concn. in the serum. The following colorimetric method is recommended: 10 cc. clear serum is acidified with 1 cc. 25% H_2SO_4. The homogentisinic acid is thus liberated from its salts or other forms of combination, and is repeatedly extd. with ether. After evapn. of the ether the residue is taken up with water and filtered. The clear filtrate is brought to exactly 4 cc.; this soln. and a standard soln. of homogentisinic acid are both treated with 0.2 cc. arsenophosphotungstic acid and 0.8 cc. cold satd. borax; and after 5 min. the solns. are compared in a colorimeter. The test can be used for concns. of homogentisinic acid as small as 0.1 mg. %. It gave negative results with the serum of 16 non-alcaptonuric persons. In these patients the intravenous injection of 0.5 g. homogentisinic acid was followed by the disappearance of the acid within 30–60 min.; 3–30% of the acid was found in the urine. A similar injection into the blood of an alcaptonuric patient was followed within 40 min. by the quant. elimination of the acid in the urine. P. Y. Jackson

Metabolic investigations during the incubation period in febrile and afebrile infections. Fr. Strieck and H. E. Ch Wilson-Glasgow. *Deut. Arch. klin. Med.* **157**, 173–85(1927).—In artificial malarial infection there is observed during the afebrile preliminary period an increase in protein and in total metabolism. This effect is apparently brought about by the stimulation of sp. centers of the central nervous system. In erysipelas and in angina without fever the increase in the basal metabolic rate was from 22.1 to 24%. P. Y. Jackson

Hypoglucemic reaction following a glucose-function test. Thor Stenström. *Deut. Arch. klin. Med.* **157**, 216–23(1927).—A subnormal concn. of blood sugar is frequently observed after the first rise following the injection of glucose upon an empty stomach. The hypoglucemia may be accompanied by unpleasant subjective symptoms. P. Y. Jackson

The question of iodine in the investigation of goiter. W. H. Jansen and F. Robert. *Deut. Arch. klin. Med.* **157**, 224–46(1927).—The concn. of I in the blood is usually found to be lower in subjects with goiter, with or without thyreotoxic symptoms. The av. concn. was 4–5 γ % (γ = 0.000001g.), as compared with the normal 12–14 γ %. The org.-inorg. I in the blood was in the ratio 75:25. The abs. I content of the thyroid gland in goiter was raised from an av. of 3.34 mg. to 6.75 mg., though the value is lower than that for normal thyroid if expressed in percent (4.87 mg. %: 9.39 mg. %). The hypoiodemia, together with the lowered concn. of I in the thyroid, supports the idea that lack of I in the diet stimulates the abnormal growth of the thyroid gland. Where

thyreotoxic symptoms are present the relative I content of the thyroid is low, averaging about 5.4 mg. %, and is close to the value found in euthyroid goiter. In genuine Basedow's disease the abs. I content is also lower than normal, while the blood and tissue juices show sometimes a hyperiodemia (12–40 γ %). Following the administration of I the relative amt. of I in the thyroid is increased to approx. 30 mg. %; and the abs. I content to about 9 mg. At the same time the I content of the blood is increased to several times its normal value. A comparison of the concn. in the thyroid and in the blood is not alone a sufficient measure of the extent of abnormal thyroid function. The I plays an important role in the elaboration of the thyroid hormone and in its physiol. action, but its total quantity is of less importance than the type of compd. in which it occurs. P. Y. JACKSON

Changes in the blood plasma in tertiary syphilis with positive complement test. K. RECKNAGEL AND V. GAUPP. *Deut. Arch. klin. Med.* **158**, 9–15(1928).—The total protein, the albumin-globulin concns., the NaCl content and the viscosity were detd. in 45 cases, all of which gave a positive Wassermann test. The total protein varied from 6.32 to 8.86 g. %, with an av. 7.81 g. %; the albumin from 2.88 to 6.61 g. %, av. 5.15; globulin 1.41 to 4.88 g. %, av. 2.22. In 20% of the cases the globulin comprised more than 40% of the total protein. In the plasma the highest value observed was 0.54 g. %, the lowest 0.23. In more than 70% of the cases the concn. of globulin was higher than the normal av. 0.18 g. %. P. Y. JACKSON

The pathological physiology of gastric juice secretion. P. BONEM AND K. EGGERT. *Deut. Arch. klin. Med.* **158**, 136–41(1928).—There is always more Cl ion than HCl in the gastric juice, and the secretion of Cl ion does not cease in achylia of whatever origin. The concn. of Cl ion in the gastric juice is constantly about 0.35% higher than in the blood. Expts. are under way to det. whether the formation of HCl from chlorides is a catalytic action. Clinical observations are given of the total acid, free acid, N and Cl in the gastric juice in various pathological conditions of the stomach, when secretion is excited by a test meal contg. no Cl or N. P. Y. JACKSON

Investigation of the significance of the reticulo-endothelial system in water retention. OTTO DEICKE. *Deut. Arch. klin. Med.* **158**, 142–8(1928).—Intravenous injection of electrolytic collargol, after a preliminary period in which much or little water was taken, led to increased diuresis, and a typical di-phase curve for blood diln. The vol. of water excreted depended upon the amt. taken during the preliminary period. The effect of the collargol was not merely upon the kidneys, but the entire mechanism for water equil. was set into action. Alterations were observed in the rate of exchange between the blood and the tissues. P. Y. JACKSON

Disturbance in the water equilibrium in affections of the hypophysis. HELLMUT MARX. *Deut. Arch. klin. Med.* **158**, 149–72(1928).—Since affections of the hypophysis, such as tumors, affect neighboring parts of the brain, the disturbances noted in the water equil. cannot be definitely ascribed to hypo- or hyperfunction, or to cerebral changes. In tumor of the hypophysis, a strong water retention was noted, while the hemoglobin curve showed only slight and irregular dilutions of the blood. After the ingestion of water clinical observations showed not only irregularities in the water equil., but usually also in the sugar equil. P. Y. JACKSON

The more accurate diagnosis of diseases of the liver. I. Cholesterol and cholesterol esters in the blood of subjects with affections of the liver. A. ADLER AND H. LEMMEL. *Deut. Arch. klin. Med.* **158**, 173–213(1928).—In acute yellow atrophy of the liver there is usually found a subnormal concn. of cholesterol and its esters in the blood. Improvement of the condition is followed by a rise to super-normal values. In sub-chronic atrophy a high concn. of cholesterol was noted, but the concn. decreased to subnormal values as the condition became progressively worse. A decrease in cholesterol noted in acute atrophy and in hepatopathia corresponds to a degenerative decompn. of the liver tissues; and an increase then marks a regenerative stage. The change from hypo- to hyper-cholesterolemia takes place with the change from bilirubin to urobilin in the urine. In toxic icterus increased concn. of cholesterol is observed to accompany a strong bilirubinuria. In cirrhosis of the liver, normal or slightly subnormal concns. of cholesterol are found; a sharp fall in concn. accompanies an itensification of the disease. Splenomegalia did not affect the amt. of cholesterol in the blood. Hemolytic icterus showed in some cases a lower concn. of cholesterol, but normal concns. of the esters. The blood of a new-born contains normally 90–100 mg. % cholesterol; but with icterus of the new-born the cholesterol content is higher and the ester content relatively lower. In Weils' disease or septic icterus both cholesterol and its esters are found in sub-normal amts. in the serum. In all infectious conditions with icterus the cholesterol content is low. Syphilis usually increases the amt. of blood

cholesterol; but if accompanied by icterus the increase is not so great as otherwise.
P. Y. JACKSON

Comparative clinical, histological, chemical and biological studies on goiter at Munich. HANS SPATZ. *Deut. Arch. klin. Med.* **158,** 257–335(1928).—Usually a goiter contains more I than a normal thyroid; therapeutic use of I sharply increases the amt. in the goiter. In the same goiter, the biologically active parts contain a higher concn. of I than the less active. P. Y. JACKSON

Further investigation of disturbed carbohydrate metabolism in diphtheria. III. ARTHUR ELKELES AND FRANZ HEIMANN. *Deut. Arch. klin. Med.* **158,** 238–48(1928); cf. *C. A.* **22,** 3210.—In diphtheria the peroral administration of 10 or 20 g. glucose produced a sharp rise in blood sugar; as high as 300 mg. % or higher was observed. When 50 g. glucose was given the blood sugar concn. rose no higher than with smaller quantities but glucosuria set in. The post-diphtherial stage gave similar blood sugar curves. A resistance to the effect of insulin was observed in these cases; 20 units of insulin did not lower the blood sugar concn., nor affect the glucosuria. Ergotamine was not effective in all cases in decreasing the hyperglucemia. P. Y. JACKSON

Investigation of metabolism in tuberculosis. IV. Tuberculosis and chlorine metabolism. P. MÜLLER AND H. QUINCKE. *Deut. Arch. klin. Med.* **160,** 24–39(1928).—The Cl content of the skeletal muscles is 100–200% higher in tuberculosis than in the normal state. Such an increase in Cl is not found in pneumonia or in uremia. The water content of the muscles is also higher in tuberculosis but the increase is not so great as for Cl, nor is the increase in water sufficient to bring about an isotonic concn of the extra Cl. The retention of NaCl in the muscles cannot be attributed to any affection of the kidneys. In the other organs no regular variation in Cl was observed.
P. Y. JACKSON

Tuberculosis of guinea pigs and metallic poisoning. W. PAGEL. *Krankheitsforsch.* **3,** 372–98(1926).—A guinea pig infected with tuberculosis can withstand an injection of Na aurothiosulfate which would be more than sufficient to kill normal animals; histochem. and analytical detns. showed that the poison is retained in the tuberculous organism more than in the normal. After treatment with the Au, degenerative changes in the kidneys and spleen were checked. P. Y. JACKSON

Individual variations in oxygen respiration in surviving normal and inflamed tissues. G. BORGER AND H. GROLL. *Krankheitsforsch.* **3,** 443–67(1926); cf. *C. A.* **20,** 1667.—Observations were made upon the amt. of O_2 consumed by surviving ears of mice; both normal ears and ears which had been injected with various irritants, such as cantharides, pilocarpine, casein and thyroxine. Usually but not always an increased consumption of O_2 was observed after the treatment. P. Y. JACKSON

Changes in the sensitiveness of the skin after intravenous injection of definite chemical irritants, and after intravenous blood injection. E. LEHNER AND F. URBÁN. *Krankheitsforsch.* **4,** 375–80(1927).—Intracutaneous injection of various irritants produced a swollen area of skin usually of less extent than if the subject had been previously given an intravenous injection of the same or some other irritant. There were used morphine, caffeine, Na salicylate, Na silicate, Na thiosulfate, adrenaline, Na bromate, Na iodate, atophanil, krysolgan, neoarsphenamine, the subject's own blood, physiol. salt soln., and Ca chlorate soln. **Changes in the reaction of the skin after repeated action of light upon the same spot.** E. LEHNER AND F. URBÁN. *Ibid* 381–8.—Repeated exposure of a definite area of normal skin at a distance of 30 cm. for mm. to the rays of a quartz lamp produced after the first few treatments a more prompt and more intense reaction; but after about 3 treatments there was little itching and scarcely any hyperemia. At the same time the spot so treated became less sensitive to other irritants, such as the injection of morphine into the skin. Ten mins. after the exposure of the entire back of the subject to the quartz lamp the skin of the breast or the upper arm was more sensitive to the intracutaneous injection of morphine soln. This hypersensitivity persisted for only 30 min. P. Y. JACKSON

The study of inflammation. I. Gas exchange in the initial stage of inflammation. F. BRICKER AND A. TSCHARNY. *Krankheitsforsch.* **4,** 397–403(1927).—Comparisons were made between the ears of rabbits when one ear had been treated with water heated to 53°. Twenty min. after the treatment about 100 cc. less O_2 was found in the venous blood of the inflamed ear than in the other, indicating that this amt. had been taken up by the tissues. This difference was observed in spite of the more rapid flow of blood through the inflamed ear. During 4–5 hrs. the difference gradually decreased. The dry residue left by the blood was found to be the same for each ear. The CO_2 concn. in the inflamed ear was in some cases higher and in some lower than in the other ear at the same time. **II. Gas exchange in inflamed tissues in the intermediate and final**

Ibid 403–09.—Irregular results were obtained when comparison was made of O_2 consumption in the normal ears of rabbits and ears subjected for several days to irritation. As a rule a higher concn. of CO_2 was found in the venous blood of the inflamed ears. P. Y. JACKSON

Variations in the inflammatory reaction of the skin after repeated injections of various substances in the same spot. The artificial sensitization of the skin. E. LEHNER AND E. RAJKA. *Krankheitsforsch.* **5**, 57–77(1927).—Repeated intracutaneous injection of an irritating substance in the same spot produced a characteristic reaction. After 2 or 3 injections the immediate inflammation increased in intensity; but after further injections decreased. With certain irritants a secondary (later) reaction was observed in the skin after the disappearance of the primary inflammation. Tuberculin, gonavaccine, leutin, trichophyton ext., etc., were used. The intracutaneous injection of 0.05 cc. luetin into syphilitics and nonsyphilitics led in most cases to a sensitization of the skin at some distance from the point of injection; and the sensitivity was still present after several months. A general sensitization of the skin is regularly produced by extracts of microörganisms and by proteins; except for mustard oil and cignolin these irritants are of unknown constitution, but belong to the class of antigens. P. Y. JACKSON

Transmission of a mouse sarcoma by inoculation of untreated mice and of mice injected with trypan blue. G. O. E. LIGNAC AND G. A. KREUZWENDEDICH VON DEM BORNE. *Krankheitsforsch.* **5**, 113–25(1927).—Transmission of sarcoma occurred more readily into mice which had been injected with trypan blue and which retained the dye in the tissues; the tendency to infection is greatly increased by the retention of the dye. A rapidly growing sarcoma in a treated mouse could not be transmitted by the inoculation of a mouse which had not been treated with the dye; but it was easily transmitted to a treated mouse. P. Y. JACKSON

Investigations of cloudy swelling. H. GROLL. *Krankheitsforsch.* **5**, 126–49 (1927).—The extirpation of one kidney of a rabbit produced at once an increased rate of respiration in the other. After 48 hrs. hypertrophy set in, as was shown by an increase in weight, and especially by a gain in protein (residual N). Histological investigation shows that cloudy swelling always occurs in such a hypertrophied kidney or in a kidney poisoned with $HgCl_2$. Chem. analysis shows, however, that the swollen kidney does not necessarily differ from the normal in percentage content of water, solids, total N and coagulable protein. The water content may be much higher than normal, especially after $HgCl_2$ poison; the protein content may be lower than normal but the contrary is usually true in the hypertrophied kidney. Cloudy swelling was not necessarily accompanied by increased O_2 consumption; in some cases the rate was normal and in others subnormal. A cloudiness of the cells, unaccompanied by any increase in water, solid or protein content, was sometimes observed. This was noted not only in retrogressive changes, as in mercury poisoning, but sometimes in progressive changes as when a single kidney shows increased (compensatory) activity after the removal of the other. Cloudy swelling is by no means a definite term but includes many heterogeneous processes. P. Y. JACKSON

An investigation of the production in the skin of substances which increase or decrease the inflammation resulting from exposure to light, from irritation by light, and from urticaria factitia. L. TÖRÖK, E. LEHNER AND F. URBÁN. *Krankheitsforsch.* **5**, 293–307(1927).—With one arm of the subject tightly ligatured the skin of the back was exposed to a quartz lamp at a distance of 30 cm. for 10 min. One min. after the exposure 0.05 cc. of 1% morphine soln. was injected intracutaneously in corresponding spots on each arm. The resulting swelling and hyperemic area were approx. equal. After 10 min. a similar injection caused a more pronounced swelling and a larger hyperemic area in the unligatured arm. In a similar expt. blood was taken from the cubital vein of each arm 10 min. after exposure of the back to the quartz lamp. A part of the blood was treated with Na fluoride and a part centrifuged. Injection of 0.05 cc. of the serum or of the fluoride-blood from the arm with unhindered circulation caused in a spot of skin not exposed to the illumination a much more pronounced swelling and a larger hyperemic area than did the corresponding injection of blood from the ligatured arm. The increased effect was more noticeable with the blood than with the serum; though the blood itself, and especially the oxyhemoglobin, under other conditions diminishes the swelling. After the ligatured arm was exposed to the quartz light the intracutaneous injection in the back of a sample of blood from this arm had a more pronounced effect than the injection of blood taken from the other arm. Corresponding expts. are described with urticaria factitia instead of illumination with the quartz lamp; similar results were obtained. P. Y. JACKSON

Investigation of the influence upon local serum hypersensitiveness of action upon active mesenchyme (splenectomy and vital staining). I. F. Klinge. *Krankheitsforsch.* 5, 308–28(1928).—The local anaphylactic reaction in splenectomized dogs was not different from the reaction in normal animals. The same results were obtained by similar expts. upon rabbits and rats. The intravenous injection of $^1/_2$–1 cc. china ink in rabbits and dogs did not affect the anaphylactic reaction. However, when trypan blue was used in the same way a no. of rabbits and dogs so treated were protected from the anaphylactic reaction. II. *Ibid* 458–74.—The effect of trypan blue injected intravenously is to decrease the sensitivity of the skin if the dye is given less than 48 hrs. before injection of the serum; if 10 days elapse between the 2 injections an increased allergic reaction is observed, and necrosis may follow a single injection of 2 cc. serum. Where the protective effect was observed a quant. relation was noted between the amt. of dye necessary for protection and the vol. of serum injected; but some animals retained the dye in the tissues more readily than others. Intra- and subcutaneous injection of trypan blue in rabbits and guinea pigs protected against anaphylactic inflammation only the regions where the dye was retained. Apparently a pathological irritation of the tissue contg. the dye alters the chem. nature of the living tissue so that the antigen-antibody reaction cannot take place. P. Y. Jackson

The action of normal and of specific immunity serum upon paramecia. The immunity of paramecia to both sera. Matazo Masugi. *Krankheitsforsch.* 5, 375–402 (1928).—The normal serum of the rabbit or guinea pig has an almost immediate paralytic effect upon paramecia; the paralysis disappears after 2 to 24 hrs. The effect of the serum decreases when the serum is kept and disappears within a week. The effect does not appear if the serum has been heated to 56°, and the serum is not reactivated upon addn. of the complement. The immunization of rabbits and guinea pigs with paramecia results in the formation of a sp. thermostable antibody, which has a general paralytic or fatal effect upon the paramecia. Treatment of rabbits or guinea pigs with lipoid, extd. from paramecia with ether and alc.; or with the residue left after the extg. or with paramecia previously heated to 100° for 1 hr. brought about the formation of little, if any, of the antibody. Paramecia could not be immunized against the action of the normal serum; but treatment with a 400-fold diln. of the sp. serum, and gradual increasing of the concn., results after 4 days in immunization against a 1–20 concn. of the serum. Paramecia not so immunized were paralyzed and killed by treatment with the serum in this concn. The immunity persists for several generations. The immune paramecia lose the ability to combine with sp. antibodies. Morphologically they are more nearly spherical because of the storing up of fat in the protoplasm. P. Y. Jackson

Kidney function in diabetic coma. P. van Paassen. *Nederland. Maandschr. Geneeskunde* 15, 227–65(1928).—There is evidence of renal insufficiency in diabetic coma; high blood urea, sugar and ketone bodies with comparatively low values for the urine, lowered NH_3 and acid excretion and retarded phenolsulfonephthalein excretion Some authors attribute death in spite of insulin treatment to renal insufficiency. A study of 21 cases showed that fatalities (I) and survivors (II) did not essentially differ with regard to age (circulation), initial glucemia and ketonemia, CO_2 binding capacity and NH_3 excn. Kidney examn. revealed nothing significant beyond cloudy swelling and glycogen deposition. The *blood urea* was as a rule considerably higher in I, and ran parallel with the *nonprotein N.* Insulin improved the urea excretion in II. Frequently, however, insulin caused a transient rise of blood urea even in II, apparently because it induced oliguria. Death from coma is therefore not directly attributable to renal insufficiency. Nor does *insulin* reduce the permeability of kidney tissue as was shown by the phenolsulfonephthalein test in a group of normal and diabetic subjects. Insulin causes water retention, especially in severe acidotic cases, but only in coma does this retention lead to oliguria. There is, besides the renal factor, a disturbance of water excretion of extrarenal origin which fully develops under insulin treatment since the latter brings about a sudden change in the tissues deprived of alkali. M. J.

Sedimentation velocity of the chromocytes and serum protein determinations. W. H. Oeberius-Kapteyn. *Nederland. Maandschr. Geneeskunde* 15, 320–30(1928).—A study was made of 74 cases, 50 of which were inactive, subactive and active cases of tuberculosis, 8 normal adults and 18 children with various diseases. A *globulin* content over 3.6% (normal) was always assocd. with an increased sedimentation velocity, over 15 mm./hr. (Only the 1-hr. observation gives correct and uniform results.) There is, however, no parallelism. Both phenomena were assocd. with a shifting of the neutrophiles to the left and an increase in toxic granula. All active tuberculous cases showed an increased sedimentation velocity. The latter permits differentiation

between active and inactive cases, especially in tuberculosis of the bronchial lymph glands, where the temp. is frequently normal. The literature on sedimentation velocity in tuberculosis is reviewed. MARY JACOBSEN

Serum proteins and antibodies. G. KAPSENBERG. *Nederland. Tijdschr. Hyg. Microbiol. Serol.* **3,** 71–99(1928); cf. *C. A.* **15,** 2486; **16,** 748; **18,** 2380; **19,** 1894.—The reagins and agglutinins of the Wassermann, Sachs-Georgi and true agglutinin (typhoid and paratyphoid) reactions are contained quant. in the globulin fraction of the serum and uniformly distributed over all globulins regardless of the mode of their pptn. The intensity of the reaction is proportional to the quantity of globulin. The agglutinins seem to be attached to the globulins *in vivo,* since the latter give the full reaction in soln. after the albumins have been pptd. by the method of Freund and Sternberg. Conclusions: Albumin and globulin are chemically different proteins. Herzfeld and Klinger's view of the structure of proteins is adopted according to which the protein particles are cylinders of individual mols., each of which resembles a watch spring. The globulins as differentiated according to their soly. in salt solns. differ from each other only with regard to the no. of mols. to a cylinder. The reagins attach themselves to the individual mols. not to the cylinders. The albumin mols. have no affinity for antibodies. The Wassermann and Sachs-Georgi reagins may be considered as true antibodies, *viz.,* antilipoids: (1) They react with serum proteins like true antibodies. (2) It is known that a serum may give a pptn. reaction besides complement deviation and it is probable that the syphilitic antibody gives both the Wassermann and the Sachs-Georgi reactions. (3) Landsteiner and Klopstock have succeeded in producing antilipoids by immunological methods. In extending Ehrlich's side-chain theory, K. assumes that an antibody has a globulinophilic and an antigenophilic group. The latter is strictly sp. in those antibodies whose antigens are not related to others, and only relatively sp. in those whose antigens are related, *e. g.,* typhoid-paratyphoid. MARY JACOBSEN

Clinical contribution to the study of diabetes insipidus. ADRIANO BOCCHINI. *Pediatria Rivista* **36,** 697–707(1928).—Report of 3 cases all of which were characterized by incoercible polyuria and ready response to pituitary ext., and are therefore classified as the renal-extrarenal type. The blood NaCl was normal or subnormal while according to Veil this type is characterized by a high NaCl. It follows that the blood NaCl alone is insufficient for a differentiation. MARY JACOBSEN

Anaricin and its vaccinating properties. P. S. SDRODOVSKII AND H. BRENN. Bact. Reichsinst, Baku. *Centr. Bakt. Parasitenk. I Abt.* **102,** 412–6(1927).—"Anaricin" can be prepd. by the Ramon HCHO method as applied to diphtheria toxin. It will immunize against ricin. JOHN T. MYERS

The immunizing power of bacterial lipoids. IV. The increased toxicity of defatted bacterial bodies. R. KAWAI. Imperial Univ. of Kyoto. *Centr. Bakt. Parasitenk. I Abt.* **102,** 423–6(1927).—Ether exts. of bacteria are not antigenic, being taken up by parenchymal cells without stimulating antibody formation. Bacterial proteins are the true antigens but lipoids aid in the process by augmenting phagocytosis, defatted organisms not being readily phagocytosed. JOHN T. MYERS

The action of formalin on endotoxin (anatoxin formation). R. PFEIFFER AND H. LUBINSKI. *Centr. Bakt. Parasitenk. I Abt.* **102,** 459–70(1927).—Endotoxin is weakened from 3 to 7 fold by 4 weeks standing at 40°, or immediately by the addn. of 0.4% HCHO, in the case of *B. typhosus,* the paratyphoids, dysentery and cholera. JOHN T. MYERS

Fatty acids and mycoides lysins. JOHANN SCHUBERT. Allgemeinen Krankenhauses Hamburg-Eppendorf. *Centr. Bakt. Parasitenk. I Abt.* **108,** 151–4(1928).—Mycoides lysin can be inactivated by from 0.75 to 1.5% of the higher fatty acids beginning with myristic, especially those which are unsatd. Erucic acid will inhibit, at a concn. of 0.5%. Lipoids must play an important role in the action of antibodies. JOHN T. MYERS

The storage and binding of iodine by Trichinella in muscle. BERNARD EUG. KALWARYJSKI. Univ. Lwów. *Centr. Bakt. Parasitenk. I Abt.* **108,** 186–92(1928).—*Trichinella* in muscle have the power of combining with and storing I. The combining power depends on the glycogen content of the parasite, and the relative stability of the I complex depends on the impermeability of the cuticle to $Na_2S_2O_3$. If the I has once been completely removed by $Na_2S_2O_3$, the parasite cannot again form a firm complex. This impermeability is apparently due to the lipoid content of the *Trichinella* body. JOHN T. MYERS

Alleged acceleration of taurocholate hemolysis by normal serum. K. C. SEN AND NRIPENDRA KUMAR SEN. Allahabad Univ., Calcutta. *J. Indian Chem. Soc.* **5,** 261–8

(1928).—It was shown by Ponder (*C. A.* **18**, 2727) that taurocholate hemolysis is accelerated if serum protein is added to a mixt. of red cells and hemolyte. The authors have worked with sheep's corpuscles in saline and isotonic sucrose, using a taurocholate concn. of 5%. The time of hemolysis being observed under varying conditions it was shown conclusively that in no case was acceleration of hemolysis due to the addn. of normal serum, and they conclude that Ponder's results may be due to some particular conditions but are not generally true. Defibrinated human corpuscles were also used to check results. Sucrose appears to have an inhibiting effect on taurocholate hemolysis of sheeps corpuscles. Normal serum inhibits hemolysis of sheeps erythrocytes by sodium taurocholate both in sucrose as well as in saline, and by oleate in sucrose. It is suggested that hemolysis of red blood corpuscles by saponin, soap or bile salts is due to a peptizing influence on some of the membrane constituents and that there is no essential difference in the mechanism of hemolysis by saponin, etc. Normal serum on hemolysis makes the membrane constituents less easily peptizable by a sensitizing action and displaces the adsorbed hemolyte from the cell surface due to its great adsorption on the surface of the stroma. D. H. POWERS

Acclimatization and ionic antagonism with sheep serum and other colloids. SATYA PRAKASH, S GHOSH AND N. R. DHAR. Univ. of Allahabad. *J. Indian. Chem. Soc.* **5**, 313–28(1928).—The authors study the phenomenon of acclimatization with concd. and dil. solns. of As_2S_3, mastic and gamboge. In all cases when the addn. of acids is spread over several days, the quantitity of electrolyte to effect coagulation is *smaller* than that required when it is added all at once, *i. e.*, it shows neg. acclimatization. This phenomenon is more marked in dil. solns. The stability of dil. sheep serum toward coagulation by univalent ions of NaOAc, K_2F_2, $(CO_2K)_2$, etc., is greater than a concd. serum. Ionic antagonism is developed when serum is coagulated by mixt. of cations such as NaCl and $Ce(NO_3)_3$, NaCl and HCl, $BaCl_2$ and HCl, $CeNO_3$ and HCl, $(CO_2K)_2$ and HCl, K_2F_2 and HCl, NaCl and $(CO_2H)_2$, K_2F_2 and Cl_2CHCO_2H and Cl_3CCO_2H and NaOAc. Sheep serum behaves in certain respects like sols of mastic, gamboge, As_2S_3 and is capable of adsorbing similarly charged ions, but it is not hydrolyzed to the same extent as the gums, Prussian blue and $CuFe_2(CN)_6$. The neg. acclimatization of sols by acids originates from the checking of hydrolysis of the sols by acids. Ionic antagonism, decrease of viscosity of sols and positive acclimatization are due to the adsorption of similarly charged ions. The abnormal diln. effect of hydrolyzable sols is due to increase in degree of hydrolysis and increase in the ratio of the adsorption of the neg. to that of the positive ion on diln. The phenomenon of neg. acclimatization will only be observed in those cases where the adsorption of the oppositely charged ions is very high and that of similarly charged ions is negligible. D. H. POWERS

Spinal urea and chlorine in the retention of these substances. P. SAVY AND H. THIERS. *Compt. rend. soc. biol.* **99**, 516–8(1928).—Clinically considered, the detn. of urea and Cl in the spinal fluid does not give sufficient evidence to judge of the retention of these substances. It requires 53 hrs. for the spinal urea to come into equil. with the blood, and a longer period is necessary for the Cl. In the presence of uremia or in conditions of hyperchloremia and hyperchloration of the tissues the spinal Cl follows the blood Cl. L. W. RIGGS

Psoriasis: blood chemistry studies: treatment. B. THRONE AND C. N. MYERS. *New York State J. Med.* **28**, 914(1928); *J. Am. Med. Assoc.* **91**, 757.—In 35 cases of psoriasis studied there was no N retention The blood of untreated patients was normal in its sugar, chlorides, urea and uric acid content. $Na_2S_2O_3$ is of great value in the treatment of cases with a high sugar and low chloride content of the blood, but is of no value in the treatment of patients whose blood does not show the so-called metallic picture. Au therapy is useless and is contraindicated in cases of high blood sugar and low blood chlorides. L. W. RIGGS

Threshold of sugar elimination in diabetes. U. SPERANZA. *Policlinico* **35**, 288 (1928); *J. Am. Med. Assoc.* **91**, 683.—Conclusions: (1) The threshold of sugar elimination by the kidney undergoes important variations in the same individual, under the influence of diverse causes. (2) The variations in threshold value are, in general, in correspondence with the variations in glucemia, but they do not run exactly parallel. (3) Of the various factors capable of affecting the relations between the threshold and glucemia values, carbohydrate restriction and insulin medication act in a diametrically opposite manner to carbohydrate administration and adrenaline medication. L. W. RIGGS

Venesection hyperglucemia in dogs. HIRSOHI TACHI. *Tohoku J. Exptl. Med.* **11**, 14–32(1928); cf. *C. A.* **22**, 2623.—In this study with female dogs the blood was withdrawn from a previously deafferented region so that almost no pain occurred. For

the production of venesection hyperglucemia about 25 g. of blood per kg. of body wt., or $^1/_4$, or more, of the blood was removed. A removal of $^1/_8$ of the total blood results in a hyperglucemia of 0.2%. Double splanchnectomy causes the development of venesection hyperglucemia to disappear or to be much reduced, unless the loss of blood is large when a moderate hyperglucemia occurs. L. W. Riggs

Edema formation. I. Edema formation by perfusion of the isolated thigh preparation, in rabbits with impaired thyroid function. Chomatsu Sato. *Tohoku J. Exptl. Med.* **11**, 33–40(1928).—The literature is cited in 38 references. Perfusion of the surviving thigh prepn. of the hyperthyroidic rabbit with Ringer soln. increased the formation of edema over that in normal animals. With athyroidic rabbits the formation of edema was less than in normal animals. **II. Edema formation during the absence of vitamin B.** *Ibid* 41–6.—Rabbits with avitaminosis B and paralyzed extremeties when perfused with Ringer soln. showed less edema formation than normal animals. In rabbits without paralyzed extremities the edema was generally greater than in normal animals. L. W. Riggs

Influence of air pressure changes on the composition of the blood. I. Respiration under excess of oxygen pressure in man. Kokichi Izumiyama. *Tohoku J. Exptl. Med.* **11**, 47–55(1928).—The O pressure of the expired air was measured by the excess pressure app. according to Tiegel, and it varied from 8 to 20 cm. of water. With 7 subjects under excess of O pressure there was a diminution in the hemoglobin, red cell count, blood sugar, NaCl, serum albumin and serum viscosity Thirty or more min. after the removal of the excess of O pressure these factors of the blood had returned to their initial or more frequently above their initial values. L. W. Riggs

Effect of hemorrhage upon the rate of liberation of adrenaline from the suprarenal gland of dogs. Shizuka Saito. *Tohoku J. Exptl. Med.* **11**, 79–115(1928).—In cava-pocket expts. on dogs under ether, removal of 0.2 of the total blood caused a small increase in the rate of adrenaline secretion by the suprarenals. Removal of 0.1 of the blood was not certain to cause the hypersecretion of adrenaline. In the lumbar route expts. on the non-fastened non-anesthetized dogs the hemorrhage of $^1/_{15}$ of the total quantity of the blood was most effective in evoking an increase, though slight, of the adrenaline discharge. In general, the greater the hemorrhage, the greater and the longer the hypersecretion of adrenaline from the suprarenal capsule. The material difference between the 2 sets of expts. is attributed to the narcosis. L. W. Riggs

Tissue respiration and increase of erythrocytes in icterus. Ei-hichiro Tsukamoto. *Tohoku J. Exptl. Med.* **11**, 146–50(1928).—Obstructive icterus by ligation of the *Ductus choledochus* caused a diminution of O consumption of the blood and an increase in the production of erythrocytes. The cellular respiration of the kidneys and muscles is diminished and that of the liver is increased by obstructive icterus. L. W. Riggs

The abolition of stasis in inflamed blood vessels by alkali. J. H. Regenbogen. *Frankfurter Z. Path.* **36**, 280–315(1928).—The stasis of inflamed vessels can be removed by means of 3 $NaHCO_3$ soln. injections, given during $1^1/_2$ hrs., but the abolition is effected even better within 10 min. by means of a single injection of blood serum dialyzate, obtained from frogs which had been immersed in distd. H_2O. The effect is brought about by the diffusing OH ion. F. B. Seibert

The bromosulfalein test of liver function. Ernest Bulmer. *Lancet* **1928**, II, 325–6; cf. *C. A.* **21**, 1843.—It is safe for intravenous injection in a concd. soln., is non-irritant and in ordinary doses, absolutely non-toxic. Normal patients showed a retention in the blood of 5%, less or even none at all. In cases of liver disease there was a retention corresponding to the amt. of liver damage. The test is not one of biliary permeability, since many cases of complete obstructive jaundice did not give a 100% retention. F. B. Seibert

Relation of diabetes insipidus to the posterior lobe of hypophysis and to the tuber cinereum. Ginichi Sato. Pharmacol. Inst., Freiburg i. Br. *Arch. exptl. Path. Pharm.* **131**, 45–69(1928).—After removal of the hypophysis the tuber cinereum contains an active substance, resembling that of the posterior lobe, exerting an effect upon the uterus and on the production of urine. This substance is present in the tuber cinereum of the normal dog but in only a fraction of the amt. to appear after removal of the hypophysis. Its hormone action is evidenced by its effect in preventing diabetes following removal of the hypophysis and because if both hypophysis and tuber are destroyed diabetes develops. G. H. S.

Phosphate excretion by surviving section of tumor. Hermann Lange and Norbert Henning. Univ. Leipzig. *Arch. exptl. Path. Pharm.* **131**, 70–4(1928).—Shortly after removal from the body surviving tumor cells give up to the surrounding fluid considerable amts. of phosphoric acid; later less is given off. G. H. S.

Effect of potassium cyanide on the phosphate excretion of surviving tumors. HERMANN LANGE AND NORBERT HENNING. *Arch. exptl. Path. Pharm.* **131**, 75–9(1928).—Intoxication of surviving tumor tissue with KCN markedly increases the excretion of phosphate, an effect assocd. with death of the tumor cells. Exposure to low concns. of KCN cause a like, but less marked, effect, the reaction being reversible.
G. H. S.

Effect of narcotics on phosphate excretion by surviving tumor. HERMANN LANGE AND NORBERT HENNING. Univ. Leipzig. *Arch. exptl. Path. Pharm.* **131**, 115–8(1928).—Exposure of surviving tumor for a brief period to narcotizing concns. of phenylurethan cause a slight and reversible increase in phosphoric acid excretion, while longer exposure has a greater effect.
G. H. S.

Further studies on surviving tumor. HERMANN LANGE AND NORBERT HENNING. Univ. Leipzig. *Arch. exptl. Path. Pharm.* **131**, 119–26(1928).—Even after a few days tumor tissue retains its capacity to give up phosphate when exposed to narcotics.
G. H. S.

Nitrogen metabolism of normal and sarcomatous fibroblasts in pure cultures. LILLIAN E. BAKER AND ALEXIS CARREL. Rockefeller Inst. for Medical Research. *J. Exptl. Med.* **48**, 533–47(1928).—Both normal and sarcomatous fibroblasts of the rat utilize many different fragments of the protein mol. for their growth *in vitro*. α- and β-Proteoses have approx. equal growth-promoting power. A mixt. of peptones, peptides and NH_2 acids, contg. a negligible quantity of proteose, produces a temporary proliferation of normal fibroblasts, and an unlimited multiplication of sarcomatous fibroblasts, provided these substances are derived from liver which contains products of unknown nature that complete the nutritive effect of the protein degradation products. NH_2 acids contribute to the nutrition of the cells but are unable without the addn. of peptides or polypeptides to support their life. The proteolytic products are more toxic to normal than to sarcomatous fibroblasts. The hypothesis is suggested that the greater acidity produced by the large glucolysis of the sarcomatous cells may account for this difference through altering the speed of action of protein synthesizing enzymes.
C. J. WEST

Metabolism in epilepsy. IV. The bicarbonate content of the blood. WILLIAM G. LENNOX, assisted by MARGARET B ALLEN. *Arch. Neurol. and Psychiat.* **20**, 155–61(1928); cf. *C. A.* **22**, 111.—Blood was centrifugalized and the bicarbonate content of the plasma determined by the Van Slyke method in 100 epileptics. The normal plasma bicarbonate ranges between 55 and 70% by vol. In this series, 3 showed values below 55% and 9, values above 70%, but 49 were above 65%. Thus a tendency toward high normal values is shown, indicating that while the majority of patients show a normal acid-base equil in the body fluids, there is a slight tendency toward increased alky.
R. C. WILLSON

The results of the introduction of urine into the blood vessels. ENDERLEN, ZUKSCHWERDT AND FEUCHT. *Munch. med. Wochschr.* **75**, 30–1(1928).—A round piece contg. the ureter was cut from the bladder of a dog and implanted end-to-end into the vena iliaca. The toxic condition produced differs in several points from true uremia. It is assumed that the liver function is so disturbed during protein metabolism by the toxins which arise in the liver, that toxic products of decompn. are formed. No detoxifying action of the liver against the nephrogenic toxins was observed while an anastomosis between the ureter and the portal vein existed. These exptl. animals lived for a shorter time, but did not show the icterus which always appears after the introduction of urine into the cava. It was proved that the intoxication after the entrance of the icterus and the increase in the residual N can be reversible.
R. C. WILLSON

PONDER, ERIC: **The Erythrocyte and the Action of Simple Hemolysins.** London: Oliver and Boyd. 192 pp. Reviewed in *J. Lab. Clin. Med.* **13**, 1169(1928).

H—PHARMACOLOGY

A. N. RICHARDS

Asthma, adrenaline and blood pressure. W. KREMER. *Nederland. Tijdschr. Geneeskunde* **72**, I, 1795–1808(1928).—*Adrenaline injections (0.2 mg.) lower the blood pressure of asthmatics.* During an asthmatic attack the blood pressure is temporarily increased owing to an abnormally great filling of the lung capillaries, leading also to engorgement of the air passages, increased mucous secretion and Leyden Charcot's crystals. Adrenaline relieves the asthmatic attack by contracting the lung

capillaries back to normal size, thus lowering blood pressure. Spasmodic contraction of bronchial muscles is *not* held to be the cause of asthma, according to K. R. B.

Deposition of gold following intravenous treatment with sanocrysine. R. Korteweg, N. Waterman and C. Winkler Prins, Jr. *Nederland. Tijdschr. Geneeskunde* **72**, I, 2063–5(1928).—Rabbits, treated with sanocrysine doses larger than the clinical doses, exhibit a deposition of Au_2S_3 and metallic Au in the kidneys, the cornea and other organs. R. Beutner

The influence of heat and of quinine on the hemolysis of red blood cells in healthy and in sick individuals and after the use of various drugs. N. P. van Spanje. Onze Lieve Vrouwe Gasthuis, Amsterdam. *Nederland. Tijdschr. Geneeskunde* **72**, I, 2984–3001(1928).—A physiol. NaCl soln., with 0.15% quinine-HCl added, partially hemolyzes normal human blood if heated to 56.5°. At ordinary temp., a much higher quinine concn. is required for hemolysis; without quinine no hemolysis occurs at 56.5°. Blood of patients suffering from diabetes, pneumonia, blood or kidney diseases hemolyzes more readily in a quinine-contg. soln.; the same is true after taking drugs like arsphenamine insulin, quinine, salicylic derivatives, etc. R. Beutner

Remarks concerning the pharmacology of cinchophen D. Klinkert. *Nederland. Tijdschr. Geneeskunde*, **72**, I, 3663–9(1928).—A review. R. Beutner

The treatment of maniacal and depressive conditions by means of somniphen. W. Beyerman. *Nederland. Tijdschr. Geneeskunde* **72**, I, 3998–4003(1928).—Favorable reports are made on 10 cases. R. Beutner

Treatment of atrophic cirrhosis of the liver by means of calcium chloride. Jac. J. de Jong and A. Polak Daniels. *Nederland. Tijdschr. Geneeskunde* **72**, I, 4111–6 (1928). R. Beutner

Solutions of quinine in ethylurethan. Mario Giordani. Lab. Chim. della Sanità Pubblica, Roma. *Ann. chim. applicata* **18**, 239–44(1928).—Ethylurethan increases the soly. of quinine-HCl in water and renders the injection less painful (cf. Gaglio, Un nuovo preparato per l'iniezione ipodermica ed endovenosa della chinina, *Riforma medica*, May **1898**), but it makes the quinine salt unstable and toxic, particularly on exposure to light. Since, moreover, expts. by various investigators have shown that quinotoxine is readily formed from quinine-HCl, an investigation was undertaken by G. to det. whether there are substances which accelerate this *formation of quinotoxine*. Since ethylurethan renders quinine salts toxic, this was chosen as one of the substances to be tested. The method of Miller and Rhode (*Ber.* **27**, 1187, 1279 (1894); **28**, 1056(1895)) for forming quinotoxine and the expts. of Ganassini (cf. *C. A.* **16**, 2008) suggested testing various acids. The following data give the % quinine-HCl transformed to quinotoxine by the various reagents at the b. p. of the aq. or other soln. used: HCl none, H_2SO_4 8, AcOH 100, tartaric acid 100, citric acid 100, malic acid 100, lactic acid 100, HCl + AcOH 100, EtOH trace, $CHCl_3$ none, ethylurethan soln. 20. Quinotoxine is also formed when certain quinine salts are exposed to ultra-violet radiation. The accelerating action of the org. acids makes it probable that even when administered orally, quinine salts are transformed into quinotoxine provided that foods contg. org. acids have been taken. This may explain the *abnormal effects of quinine derivs.* so frequently encountered. In conjunction with expts. by Howard (*J. Chem. Soc.* **25**, 102(1872)) the results also show that prepns. for injection made with glycerol, ethylurethan, etc., become toxic because of the formation of quinotoxine. C. C. D.

Clinic on lead poisoning. I. S. Matussevich. Leningrade Inst. for the Study of Occupational Diseases. *Wiener klin. Wochschr.* **41**, 849–52(1928).—A positive correlation was found between lead poisoning and alcoholism, and between lead poisoning and low gastric acidity. Cases were more numerous in fall and winter months. D. B. Dill

The action of lecithin on the animal organism. M. T. Friedmann. State Med. Inst., Kharkov. *Z. ges. exptl. Med.* **53**, 17–43(1926).—Lecithin increases the development and activity of tadpoles and changes them to a lighter color. It increases the resistance of frogs to CO_2 in doses from 0.22 to 1.0 g. per kg. It increases the resistance to chloroform anesthesia, O lack and to warming. Similar results were obtained for warm-blooded animals in doses of 0.19 to 1.1 g. per kg. Lecithin increased the resistance of warm-blooded animals to CO and Br. F. E. Dunn

Effect of lecithin on the surviving heart of the frog. S. V. Ziganov. State Med. Inst., Odessa. *Z. ges. exptl. Med.* **53**, 72–81(1926).—Lecithin apparently acted upon the heart muscle direct and not through the sympathetic nor the parasympathetic systems. The efficiency of the heart was increased as shown by the systolic contraction and the tonus. The optimum concn. in the perfusion fluid of lecithin was 1:10,000. The beneficial action of lecithin on the heart explains its value in poisoning due to

chloroform, muscarine and other substances. Z. suggests that the beneficial action of certain endocrine products may be due to their lecithin content. Bibliography.
F. L. Dunn

Effect of thyroxine on the human organism. II. Hanns Löhr. Univ. Kiel. *Z. ges. exptl. Med.* **53**, 599–632(1927).—Clinical. Bibliography of 97 references.
F. L. Dunn

Chemical and pharmacologic properties of rhizoma Curcuma magna (Curry). A. Guttenberg. Univ. Wurzburg. *Z. ges. exptl. Med.* **54**, 642–52(1927).—From the alc. ether exts. a dye, curcuma yellow, a glucoside, an ethereal oil and a resin were isolated. The dye was pharmacologically indifferent. The osazone, m. 179–80°, and was inactive when injected into rabbits. The resin was fatal to rabbits in doses of 2.5 g. The ethereal oil was a terpene curcumen with the formula $C_{15}H_{24}$, levorotatory, and b_{12} 140–2°. 0.1–0.2% solns. in nutrient broth were bactericidal to *Staphylococcus aureus*. Cholesterol was 10% sol. in curcumen. It is excreted in the bile and appears in the urine in a glucuronic acid combination. It has a definite cholagog action and G. suggests that its bactericidal properties, its soly. for cholesterol and cholagog action suggest its value in hepatic and biliary disease.
F. L. Dunn

Chemical changes in the blood during asphyxia. I. Variations in calcium, potassium, residual nitrogen, fibrinogen, albumin and globulin content and blood cells. Rudolph Rittman. Univ. Innsbruck. *Z. ges. exptl Med.* **56**, 262–70(1927).—Mixts. of air low in oxygen were given to rabbits. The blood Ca rose. The residual N, fibrinogen, globulin and albumin showed no marked changes. The blood K was lowered.
F. L. Dunn

A case of poisoning by mercury vapor 150 years ago. R. Winderlich. *Chem.-Ztg.* **52**, 629(1928).—Supporting the contention of Stock (cf. following abstract) that many scientists have suffered from Hg poisoning, whether they realized it or not, an article of Achard (1778) is quoted in which irrefutable evidence is given that he himself contracted Hg poisoning by keeping a dish of Hg on the stove, although the room temp. was usually between 14° and 18° R. at the time.
W. C. Ebaugh

Danger of mercury and amalgam dental fillings. A. Stock. *Z. angew. Chem.* **41**, 663–72(1928).—The use of Hg in dental fillings (Cu or Ag amalgam) is especially deprecated as dangerous both to dentists and patients, as air containing 0.001 mg. of Hg per cu. m. is injurious to health.
B. C. A.

The toxicity of ethyl hypochlorite. V. Koelsch. *Zentr. Gewerbehyg. unfallverhütung.* **14**, 312–6(1927); *Bull. Hyg.* **1**, 234(1928).—It was not previously considered toxic. With animals a concn. of 0.004 g. per l. killed in 1–2 hrs.
George R. Greenbank

The action of arsphenamine preparations including stovarsol and tryparsol in experimental anthrax. N. Stolygvo. Lettlandischen Univ., Riga. *Centr. Bakt. Parasitenk. I Abt.* **102**, 364–7(1927).—Neoarsphenamine in large doses had considerable value, but stovarsol and treparsol have very little.
John T. Myers

Insulin, folliculin and glucemia in the normal dog. F. Rathery, R. Kourilsky and (Mlle.) Yv. Laurent. *Compt. rend.* **187**, 255–7(1928).—Folliculin restrains the action of insulin in the fasting animal. In the dog with alimentary hyperglucemia, folliculin prevents the usual reduction of the glucemia by insulin.
L. W. Riggs

Stovarsol, a specific in contagious agalactia in the sheep and in the goat. J. Bridré, A. Donatien and D. Hilbert. *Compt. rend.* **187**, 262–3(1928).—The precise nature of the organism which causes contagious agalactia is unknown. Subcutaneous injections of the Na compd. of stovarsol in doses not exceeding 0.03 g. per kg. acted as a true specific on the lesions of this malady which has hitherto resisted all medicinal treatment.
L. W. Riggs

Spirocheticide properties of the element vanadium. Asterogenesis around the particles of vanadium. C. Levaditi, P. Lépine and (Mlle.) R. Schoen. *Compt. rend.* **187**, 434–6(1928).—V should be included among the therapeutic substances active in spirochetosis. The element is efficient in inorg. and org. derivs., and especially in the elementary form and separate from other metals. V in powder with a fineness of 10 to 30 or 40μ is placed in suspension in 9 times its wt. of olive oil, and is administered by intramuscular injection in doses contg. 0.1 g. of V per kg. Sections of muscular tissue in treated animals show an asterogenic accumulation of microörganisms around the particles of V.
L. W. Riggs

Efficiency and safety of the prevention of goiter. O. P. Kimball. *J. Am. Med. Assocn.* **91**, 454–9(1928).—An extensive expt. in the prevention of goiter in Michigan by the addn. of 1 part KI to 5000 parts of common salt proved that this treatment was efficient and safe.
L. W. Riggs

Effects of ethylene-oxygen anesthesia on the normal human being. John D.

BRUMBAUGH. *J. Am. Med. Assocn.* **91**, 462-5(1928); cf. *C. A.* **22**, 3697.—The following conclusions were drawn from a study of 15 normal subjects under ethylene-O anesthesia for 1 hr., without preanesthetic medication and without operative or other complicating factors: There was no change in the hemoglobin, icterus index, coagulation time of the blood, character of the blood clot, urine or pulse rate. There was an increase in the blood sugar and in the systolic blood pressure. There was no change in the blood urea immediately following the anesthesia, but there was a definite increase averaging 18.7% in the blood urea 24 hrs. after anesthesia. There was a moderate but temporary decrease in the CO_2 combining power of the blood. L. W. RIGGS

Sulfur waters of Helouan-des-Bains, their composition and therapeutic value. S. NARKIRIER. *J. Egyptian Med. Assocn.* **11**, 57-72, 114-28(1928). (In French.)—The Helouan (Egypt) springs are classed as mineral waters, and are among the richest in the world in H_2S. Eight outcrops of the water are known. Five of these sources, which are located near the Thermal Establishment, have a combined output of 785,000 l. per day of water of identical compn. at 32° and contg. 54 to 59 mg. of H_2S per l., 4.8 g. of NaCl and 0.57 of bicarbonates calcd. as $NaHCO_3$. It is stated that H_2S is readily absorbed into the circulation when taken by drinking the water, bathing in the water, or by inhalation of the H_2S gas. It is claimed that the absorbed H_2S has an antiseptic action, that it facilitates respiratory exchanges between the blood and the tissues by activating the combustions, that it increases the general metabolism, and that it corrects the metabolism of S by bringing this element to the cells in an easily assimilable form. The treatment of various diseases by baths in the Helouan springs is described at length. L. W. RIGGS

Accidents and complications occurring during the treatment of bilharziasis by antimony compounds. M. KHALIL. *J. Egyptian Med. Assocn.* **11**, 97-106(1928); cf. *C. A.* **21**, 135.—The precise routine for the prepn. and administration of tartar emetic in bilharziasis is described. When this technic is followed rigidly, accidents and complications are of rare occurrence. L. W. RIGGS

Milk in therapeutics. TH. DOMEC. *Rev. gen. sci* **39**, 427-30(1928); cf. Barkan and Nelson, *C. A.* **18**, 1138; Högler, *C. A.* **18**, 2386.—A review of the action of milk when administered by subcutaneous or intramuscular injection L. W. RIGGS

Influence of narcosis on the immune bodies. KEN IINO. *Sei i-Kwai Med. J.* **47**, 14 44(1928).—During ether anesthesia in rabbits there was a slight decrease of agglutinins 30 to 60 min. after narcosis, with recovery in 2 hrs. Hemolysin, bacteriolysin and Forssman's antibody and complement were not affected except that they disappeared more readily than in control rabbits. With $CHCl_3$ anesthesia, agglutinins showed a decrease in 30 to 120 min. after narcosis, followed by recovery in 3 hrs. Hemolysin, bacteriolysin and Forssman's antibody and complement were affected the same as in ether narcosis. Injection of pantopon-scopolamine in rabbits did not affect the immune bodies or complement. L. W. RIGGS

Pharmacologic study of the absolute pressure of the heart. I. Study of the frog heart. ITARO KIKUCHI. *Tôhoku J. Exptl. Med.* **11**, 116-41(1928).—Ca, adrenaline, digitalis and veratrine increase the abs. pressure of the frog heart. Caffeine, quinine, physostigmine, atropine and histamine in small doses increase the abs. pressure and in large doses decrease it. K, Ba, pilocarpine, sparteine, apomorphine, alc., camphor and morphine in both small and large doses cause a reduction in the abs. pressure of the frog heart. Mg generally causes a reduction of the pressure. No definite connection appears to exist between the changes of abs. pressure of the heart under the influence of the above-named drugs and the heart rate and min. vol. L. W. RIGGS

Toxic stimulation of the vasomotor center. I. KARL JUNKMANN AND WILHELM STROSS. Univ. Prag. *Arch. exptl. Path. Pharmakol.* **131**, 1-17(1928).—**II.** WILHELM STROSS. *Ibid* 18-44.—Of all substances tested CO_2 exerts the strongest pressor effect. Caffeine, strychnine and camphor have but little influence upon the blood pressure as compared with cardiazole, coramine, hexetone, the ammonium salts and pyramidone. When the vasomotor center is under marked paralysis, caffeine and strychnine at times cause a slight increase in blood pressure when injected into an artery for transport directly to the brain. Caffeine, strychnine and picrotoxin do not noticeably increase the irritability of the vasomotor center for CO_2 or its reflex irritability. Curare appears to act in contributing to increased blood pressure in much the same way. G. H. S.

Effect of urea on the skeletal muscle of frogs. E. GABBE AND R. HOFER. Univ. Würzburg. *Arch. exptl. Path. Pharmakol.* **131**, 92-114(1928).—In frogs which have received 2.5-10 g. of urea per kg. the mech. irritability is considerably increased. The muscle intoxicated with urea responds to slight mech. stimulation with a prolonged

contraction. Sensitivity to direct elec. stimulation is not modified, but when applied through the nerve the irritability of the muscle is increased. After urea administration a max. elec. stimulation causes a contraction curve of increased height and duration. Urea diminishes the extensibility of the muscle and increases its max. performance of work. Isolated muscles suspended in physiol. NaCl are stimulated by the addn. of 0.5–1% urea. Curarization abolishes the action of urea, which acts through the nerves and their endings. G. H. S.

Influence of thyroid substance on the effect of splanchnic stimulation upon the blood pressure. E. FLATOW AND M. MORIMOTO. Univ. Berlin. *Arch. exptl. Path. Pharmakol.* **131,** 127–37(1928); cf. *C. A.* **22,** 1408.—Thyroid substance as well as non-sp. protein modifies the effect of splanchnic stimulation upon blood pressure, an effect apparently referable to the influence of the adrenaline secreted. G. H. S.

The "all-or-none law" of narcosis and the criticism of Hans Winterstein. G. MANSFELD. Univ. Pécs. *Arch. exptl. Path. Pharmakol.* **131,** 268–78(1928). G. H. S.

Validity of the "all-or-none law of narcosis" with the vegetative nervous system. KATHERINA HECHT. Univ. Pécs. *Arch. exptl. Path. Pharmakol.* **131,** 289–96(1928).—The all-or-none law of narcosis is valid for the behavior of the heart vagus. G. H. S.

Effect of adrenaline and of some other internal secretions on the contraction of mammalian skeletal muscle. HELENE WASTL. Univ. Wien. *Arch. ges. Physiol.* (Pflüger's) **219,** 337–90(1928).—Following the intravenous injection, in cats, of adrenaline muscular contraction consequent to elec. stimulation of nerves was detd., showing that one of 4 effects may be exhibited: (*a*) a simple reduction in the height of contraction (occurring in 25% of the ♂, in 37.2% of the ♀ animals tested), (*b*) an increase in the height of contraction (♂ 37 [illegible] ♀ 19.3%), (*c*) an initial transitory increase followed by a fall (♂ 25.8%, ♀ 19.3%), and (*d*) no change (♂ 11.6%, ♀ 24.2%). In all 836 animals were tested. The distribution of results with reference to sex is influenced by adrenaline dosage. The effect of adrenaline upon blood pressure is also influenced by sex, for although within physiol. limits adrenaline induces the same effect in both ♂ and ♀ cats, to higher concns. the ♀ animals are found to be the more sensitive. In all respects exts. of fresh adrenals act as do adrenaline prepns. Thyroid substances had no direct effect upon the muscle, although after thyroid treatment, as after injections of hypophysis, adrenaline is less effective. In high concns. hypophysin inhibits muscular contraction, apparently because of vasoconstriction and asphyxia of the muscle. Aside from its effect on the peripheral circulation histamine apparently exerts a direct toxic action in the muscle. Although reacting upon the vasoconstrictors, ergotamine causes no direct damage to the muscle. G. H. S.

Influence of cholesterol on experimental tuberculosis. RICHARD E. SHOPE. Rockefeller Inst. Med. Research. *J. Exptl. Med.* **48,** 321–37(1928).—Cholesterol, administered intraperitoneally, in these expts. definitely prolonged the lives of tuberculous guinea pigs when the infection was of an acute type produced by inoculation with a small dose of very virulent human type organism, but did not definitely prolong the lives when the infection was of the chronic type produced by the injection of a small dose of human type tubercle bacilli of relatively low virulence, or when the infection was more acute owing to the injection of a large dose of organisms of low virulence. It had no beneficial effect on an acute type of infection produced by the bovine type organism. Cholesteryl chloride, toluide, anilide, Na cholesterol sulfate and quinine cholesterylate did not significantly prolong the lives of tuberculous guinea pigs. Na cholesterylate, in optimal dosage, definitely prolonged life. There was a significant shortening in the duration of life of tuberculous guinea pigs subjected to the trauma of intraperitoneal injection and repeated handling as compared with tuberculous guinea pigs that were not handled or traumatized by intraperitoneal injections. C. J. W.

The cerebral circulation. IV. The action of hypertonic solutions. H. G. WOLFF AND H. S. FORBES. *Arch. Neurol. and Psychiat.* **20,** 73–83(1928).—After cats had been anesthetized with 1% solns. of isoamylethylbarbituric acid, solns. of NaCl, dextrose and urea were injected. Such hypertonic solns., intravenously or intraperitoneally, effect a constriction of the pial blood vessels, demonstrable microscopically and photographically. Increased osmotic tension of the blood seems to be the chief factor in causing this vasoconstriction. The pial artery diam. changes independently of the blood and intracranial pressures. R. C. WILLSON

Symposium on alcohol. Alcohol in its biological aspects. CHAS. R. STOCKARD. *Med. J. and Record* **127,** 195–7(1928). **The medicinal use of alcohol in the acute infectious diseases.** SAMUEL W. LAMBERT. *Ibid* 197–99. **The use of alcohol in the circulatory defects of old age.** HARLOW BROOKS. *Ibid* 199–206. **The alcohols: their**

practical utility. WM. H. PORTER. *Ibid* 206–9. **Alcohol and prohibition.** GREGORY STRAGNELL. *Ibid* 210.—Symposium with some discussion. R. C. WILLSON

The effect of kalzan on the blood calcium. BERNARD S. KAHN. *Med. J. and Record* **127,** 600(1928).—Nine g. of kalzan, a commercial Ca prepn., was dissolved in 250 cc. H_2O and given to the test subjects after a 12-hr. fast. The circulating blood Ca was raised in each instance. A typical protocol follows: Ca value before kalzan ingestion, 10.40 mg. per 100 cc. blood. Ca value 4 hrs. after kalzan ingestion, 12.60; 5 hrs., 14.32; 6 hrs., 1754; 12 hrs., 10.80. The peak of increase comes at the 6th hr., but hypernormal values exist for about 12 hrs. These results are very comparable with those following the use of Ca lactate. R. C. WILLSON

The activity of iron and its practical importance. K. KÖTSCHAU AND A. SIMON. *Münch. med. Wochschr.* **75,** 122–4(1928); cf. *C. A.* **22,** 3731.—The authors' investigations show that ferro-hydrocarbonate reacts catalytically with benzidine, guaiac, etc., in the presence of H_2O_2. This catalytic activity is always present as long as ionized bivalent Fe can be detected by means of the specific Kröhnke's isonitroacetophenone reagent. Mineral water shows the same activity under the same conditions. The aging process depends upon the oxidation of Fe^{++} to Fe^{+++} with the formation of brown $Fe(OH)_3$. Aging is impossible without the oxidizing agent. In the presence of O_2 the aging process is sharply accelerated by the action of light. In the Stuttgart-Canstatt iron mineral baths, opportunity is given for the internal and external use of catalytically active ferrous Fe. R. C. WILLSON

Recent work in the field of chemotherapy. GIEMSMA. *Z. angew. Chem.* **41,** 731–7 (1928). E. H.

Progress in chemotherapy in the field of veterinary medicine. A. WOLLERSHEIM. *Z. angew. Chem.* **41,** 145–7(1928). E. H.

I—ZOÖLOGY

R. A. GORTNER

The action of extremely dilute solutions of metallic salts on the growth and development of tadpoles. KARL KÖNIG. Univ. Wien. *Z. ges. exptl. Med.* **56,** 581–93 (1927).—A rhythmic variation in growth and development was observed for Pb and Ag nitrate with increasing diln. F. L. DUNN

Hydrogen-ion concentration of fish muscle. C. C. BENSON. Univ. Toronto. *J. Biol. Chem.* **78,** 583–90(1928).—The p_H of fish muscle was detd. by covering a freshly cut surface with powd. quinhydrone, inserting a bare Pt electrode, and reading the voltage of this combination against a calomel electrode. Fatigued muscle of the haddock was acidic at the time of death and varied only slightly during the changes of rigidity. Rested muscle showed an alk. reaction which gradually changed to the acidic values of fatigued muscle. The muscle of the hake fish was alk. 5 hrs. postmortem and never gave an acid reaction. Cod muscle remained neutral and varied only slightly. ARTHUR GROLLMAN

The question of the specificity of the intracellular dehydrogenases. I. The dehydrogenase of cunner muscle. MARY E. COLLETT. Western Reserve Univ. and Marine Biol. Lab., Woods Hole. *J. Biol. Chem.* **78,** 685–9(1928).—In the muscle of the cunner fish, a single dehydrogenase is present. It is capable of oxidizing anaerobically several donators, *viz.*, succinic, citric, glycerophosphoric, lactic, *l*-malic, acetic and butyric acids. ARTHUR GROLLMAN

Study of the blood meal of the anophelines in the Dutch East Indies, with the aid of the precipitin reaction. I. E. W. WALCH AND M. SARDJITO. *Geneeskund. Tijdschr. Nederland. Indië* **68,** 247–68(1928).—The study of the blood contained in the stomach of several species of anophelines showed that the preference for human blood runs parallel to the frequency with which a mosquito acts as a malaria carrier. M. J.

Effect of salt desequilibration on some marine organisms. E. KREPS. *Russkij fisiol. zhurnal* **9,** 118–9(1926); *Ber. ges. Physiol. exptl. Pharmakol.* **44,** 633–4.—*Balanus* (*Crustacea, Cirrhipedia*) is resistant to considerable variations of osmotic pressure. While in the normal medium systole and diastole are equally strong, the former is increased and the latter is weakened by the addn. of Na or K. Mg and Ca have the reverse effect. Loeb's law of salt antagonism is thereby confirmed. The relation Na + K/Ca + Mg which characterizes each stage of activity remains largely const. even if the salt content of the water varies considerably. MARY JACOBSEN

The influence of temperature on the photosensory latent period. S. HECHT. Columbia Univ. and Zoöl. Station, Naples, Italy. *J. Gen. Physiol.* **11,** 649–56(1928).

The relation of time, intensity and wave length in the photosensory system of Pholas. *Ibid* 657–72.—Largely physiol. but of interest to students of photochemistry. C. H. R.

The influence of oxygen tension upon the respiration of unicellular organisms. WM. R. AMBERSON. *Biol. Bull. Marine Biol. Lab.* **55**, 79–91(1928).—The respiratory exchanges of *Paramecium* and of fertilized *Arbacia* eggs were practically const. over a wide range of O tensions. In the fertilized *Arbacia* egg the O consumption was practically const. between 228 and 20 mm. Hg partial pressure of O. Between 80 and 20 mm. Hg there was a slight diminution of O intake. At 20 mm. Hg the consumption of O was about 90% of that at atm. pressure. Below 20 mm. Hg the O consumption was sharply reduced. The cleavage of *Arbacia* eggs proceeds at a normal rate down to very low tensions of O. Below 11 mm. Hg the rate became slower and cleavage ceased at 4 mm. Hg. L. W. RIGGS

Comparison of the oxygen consumption of unfertilized and fertilized eggs of Fundulus heteroclitus. MARJORIE BOYD. *Biol. Bull. Marine Biol. Lab.* **55**, 92–9(1928).—By 3 methods it was shown that the O consumption of the eggs of *Fundulus heteroclitus* was greatly increased after fertilization. This increased rate of O consumption was at its max. from 60 to 90 min. after the addn. of the sperm in a period immediately preceding the first cleavage. The O consumption then fell to a level practically identical with that of unfertilized eggs. L. W. RIGGS

The bacteriological sterilization of Paramecium. ARTHUR K. PARPART. Amherst Coll. *Biol. Bull. Marine Biol. Lab.* **55**, 113–20(1928). L. W. RIGGS

Oxygen consumption of insect eggs. ROY MELVIN. Iowa State Coll. *Biol. Bull. Marine Biol. Lab.* **55**, 135–42(1928).—Factors accompanying and influencing metabolism as detd. by O consumption during embryonic development of *Anasa tristis* DeG., *Tropoea luna* L., *Samia cecropia* L and *Pyrausta ainsliei* Heim show that the wt. of the shell is an important factor and that the effects of temp. are not as pronounced during the formative period as during the period of late incubation. The variation in the length of the formative period appears to depend on the length of the incubation period and not on the place where the eggs chance to be laid as has been suggested. L. W. RIGGS

Chemical constitution and metabolism of fat bodies in insects. JEAN TIMON-DAVID. *Bull. soc. chim. biol.* **10**, 784–95(1928); cf. *C. A.* **21**, 2741.—The subject is reviewed historically with 26 references to the literature. The tissues were ground and dried with precautions to avoid oxidation, and the fats were extd. with Et_2O or $CHCl_3$. The usual analytical figures were detd. for 7 fats and the results are classified as follows: (1) semi-drying oils from *Thaumetopaea Pityocampa* S., *Sericaria Mori* L., (2) non-drying oils from *Tenebrio molitor* L., *Pyrausta nubilalis* Hubn, *Cossus ligniperda* F., *Ergates faber* L., (3) semi-drying fats from chrysalides of *Pieris brassicae* L., (4) non-drying fats from *Oryctes nasicornis* L., *Myelobia smerintha* Hubn, (5) fats with very high indices of sapon. and very low indices of I (butters) from *Pemphigus utricularius* Pass., and *P. cornicularius* Pass. The second of the above classes includes the majority of insects studied. The diversity of fats in insects is remarkable. L. W. RIGGS

Toxic action of acids of the formic series in relation to the adaptation of the organism. J. BĚLEHRÁDEK AND F. SCHWARZ. *Bull. soc. chim. biol.* **10**, 909–19(1928).—The time of survival (T) of tadpoles of *Rana fusca*, *Tubifex* (*rivulorum*), *Daphnia* and the vinegar eel *Anguillula aceti*, placed in aq. solns. of formic, acetic, propionic, butyric and valeric acids, resp., of different concns. (C) is expressed by the formula $T = A/C^b$, in which A and b are consts. Notwithstanding the similarity of this formula to the equation for adsorption, the toxic action of these acids is not detd. by adsorption alone, the exponent b in the majority of cases being greater than 1. There appears no relation between the toxicity of these acids and their surface tension. The order of toxicity of the acids is not the same at different concns. The vinegar eel presents the greatest resistance to the acids of this series, in particular to acetic and propionic acids. L. W. RIGGS

Specific dynamic action in beetles. A. GOURÉVITCH. *Compt. rend.* **187**, 65–7 (1928).—The ingestion of sugar in the beetle, *Periplaneta orientalis*, increased the consumption of O but slightly or not at all. Beetles fed casein or albumin increased their gaseous exchange an av. of 40%. This increase is attributed to sp. dyanmic action. L. W. RIGGS

Lipase of the larvae of Galleria mellonella. V. PERTZOFF. *Compt. rend.* **187**, 253–5(1928).—The fat was extd. from the ground larvae with acetone and the residue of the larvae was dried over H_2SO_4. The lipase was extd. from the dried powder by glycerol, $N/1$ NaCl or dil. NH_4OH. A soln. in $N/1$ NaCl, preserved with toluene, hydrolyzed emulsions of olive oil and beeswax. At 45° the lipase had a hydrolyzing

action on the bacilli of tuberculosis. In general the results previously reported by S. Metalnikov are confirmed. L. W. Riggs

Does radium act on insects during their metamorphosis? (Mme.) Hufnagel and deNabias. *Compt. rend.* **187**, 431–3(1928).—Both pupae of *Calliphora* and caterpillars of *Hyponomenta* subjected to strong irradiation by γ-rays showed no appreciable modifications of their constituent elements. L. W. Riggs

Rufine, a tegumentary pigment of Arion rufus. Ch. Dhéré and Chr. Baumeler. *Compt. rend. soc. biol.* **99**, 492–6(1928).—The process of extn. of rufine from *A. rufus* is described. The ext. presents many color changes under different conditions of acidity, concn. and oxidation. Further work is in progress. L. W. Riggs

Influence of sodium fluoride on frog sperm. Jean Rostand. *Compt. rend. soc. biol.* **99**, 502–3(1928).—Toad eggs fertilized with frog sperm which had been treated for several min. with a 1 to 150 soln. of NaF gave embryos some of which lived 10 days. L. W. Riggs

The effect of chemicals on viscosity of protoplasm of ameba as indicated by Brownian movement. Floyd J. Brinley. Univ. of Pennsylvania. *Protoplasma* **4**, 177–86 (1928).—The culture medium contg. *Amoebae proteus* was placed on a thin slide under a cover glass. A drop of the chemical to be tested was placed on the edge of the cover glass and allowed to diffuse under it. The organisms were observed microscopically with dark field illumination. HCN ($M/300$) produces an initial increase in viscosity which is immediately followed by a liquefaction of the protoplasm. HCl ($M/36$) causes a solidification of the entire organism and NaOH produces a liquefaction. CO_2 (satd. aq. soln.) produces a gelation of the ectoplasm and a soln. of the endoplasm. NaCl ($M/16$) and KCl ($M/7.5$) produce a liquefaction. $CaCl_2$ ($M/11$) and $MgCl_2$ ($M/20$) cause a solidification of the protoplasm. Alc. $CHCl_3$ (satd. aq. soln.), and ether (4%) produce a final soln. of the protoplasm. M. H. Soule

Function of the inter-renal organs of selachians. Bruno Kisch. Zoöl. Sta., Naples. *Arch. ges. Physiol.* (Pflüger's) **219**, 426–61(1928).—Removal of the organs leads to condensation of the pigment in the chromatophores of the skin, retardation of respiration and an inverse motor respiratory reaction, muscular weakness and inertia, contraction of the body muscles, hypersensitiveness to lack of O, and finally death. These facts, taken in conjunction with the known effects of adrenalectomy in mammals, suggest that these organs deliver to the blood stream a substance which favors the oxidative decompn. of certain metabolic products that are toxic. Injections of acid exts. of inter-renal tissue cause, in animals which have been operated upon, the symptoms to diminish or to disappear, while injections of sea-water, adrenaline or liver exts. are inert. G. H. S.

Behavior of phosphoric acid in artificially perfused frog muscle. Tohoru Kitano. Univ. Greifswald. *Arch. ges. Physiol.* (Pflüger's) **219**, 500–13(1928).—Phosphoric acid formation and recombination is to a high degree dependent upon the O supply. G. H. S.

The salmon canning industry (Clark, Clough) **12**.

12—FOODS

F. C. BLANCK AND H. A. LEPPER

Preservatives allowed in foodstuffs in Germany. G. Riess. *Reichsgesundheitsblatt* **2**, 359–61(1927); *Bull. Hyg.* **3**, 400.—An account of the regulations. Tables are given showing the max. amts. of H_3BO_3, borates, H_2SO_3, HCHO, $(CH_2)_6N_4$, HCOOH, C_6H_5COOH and benzoates permissible; also where certain of the above preservatives may not be used. George R. Greenbank

The retention of the antiscorbutic vitamin after sterilization. E. Remy. Inst. Hyg. Univ. Freiburg. *Z. Untersuch. Lebensm.* **55**, 385–93(1928); cf. *C. A.* **22**, 3388.—Cauliflower, green beans, green peas, carrots, spinach and tomatoes were sterilized by heat (canned) and tested after from 1 to 7 months for vitamin C by standard animal tests with guinea pigs. The animal tests were checked by comparison with Bezssonoff's reagent. Cauliflower, green beans and carrots failed to hinder the development of scurvy symptoms except in large doses while green peas, spinach and tomatoes retain a considerable amt. of the antiscorbutic factor. The Bezssonoff color reaction, in general, ran parallel to the animal tests. C. R. Fellers

Scientific control in the flour milling industry. C. W. Herd. Woodlands, Ltd., Dover. *Food Manuf.* **3**, 455–7(1928); cf. *C. A.* **22**, 2998.—The industrial chemist's work may be divided into (1) investigation of raw material, (2) control during the

mfg. process and (3) examn. of the finished product. The cereal chemist is no exception and the work of the mill lab. is considered under these headings. J. A. K.

The bleaching of flour. C. H. Schweizer. Lab. Bd. Health, Bern. *Mitt. Lebensm. Hyg.* **19**, 223–35(1928).—A general discussion of imported bleached flour with suggestions as to analytical procedures for its detection. C. R. Fellers

Nutritional bread (tomato). J. Boyd. *Food Manuf.* **3**, 446(1928). J. A. K.

Preservative tablets and preserved milk samples. L. M Lambert. Calif. Dept. Agr., *Mo. Bull.* **18**, 449–53(1928).—Milk preservative tablets from 11 sources were examd. chemically. $HgCl_2$ was present in all, varying from 41 to 80%. NH_4Cl was present in some tablets and increased the soly. of the $HgCl_2$. Citric acid was present in 1 sample which had been found previously to cause curdling. Boric acid was a common constituent. Milk samples preserved by the use of these tablets were not always sterile. CH_2O was less effective than $HgCl_2$. A finely divided flocculent substance was suspended in the preserved milk samples, although this fine curd apparently did not appreciably influence the fat or other tests. A very slight decrease in fat percentage was found in the preserved samples. This decrease was greatest where $HgCl_2$ was present in the preservative. C. R. Fellers

The grading of milk and cream for manufacturing purposes. Frank H. McCampbell. Calif. State Dept. Agr. *Mo. Bull.* **16**, 692–700(1927).—Grade definitions and practical suggestions to dairymen and creamery operators for maintaining high-grade dairy products. C. R. Fellers

Determination of added phenol and cresol in milk. H. T. Fawns. *Analyst* **53**, 489–90(1928).—The method of Mumford (*C. A.* **7**, 2734) for the detection of phenol in the presence of other org. substances is applied to the analysis of milk. Taste and smell cannot detect less than $^1/_{10,000}$ parts of phenol; the reaction used is quant. for 5–100 mg. of phenol per 50 cc. of milk. W. T. H.

A new method for determining fat in milk and cream bonbons (cream chocolates). Hans Barsch. *Chem. Ztg.* **52**, 659(1928).—Dissolve 25 g. of the candy in 100 cc. hot H_2O in a 500-cc. flask, add 10 cc. of 25% NH_3 soln., 50 cc. EtOH (96%) and 100 cc. of HCl-free C_2HCl_3, and boil with a reflux condenser for 20–30 min. Cool, remove carefully to a separatory funnel, allow to run over a filter contg. kieselguhr, and then into a 50-cc. buret for settling. Transfer the C_2HCl_3 to a glass dish, evap. and weigh. The fat is very clean and pure. W. C. Ebaugh

Some data concerning the composition of California creams. N. C. Smith. Div. of Chem., State Dept. Agr., Calif. State Dept. Agr., *Mo. Bull.* **16**, 728–36(1927).—Analysis of 20 samples of cream showed the % of CaO in the ash was the least variable factor and of the greatest significance in detecting the neutralization of cream with lime. Sapon., I, Polenske, Reichert-Meissel and modified Valenta nos. fell within the general range for normal butters and were of little value in detg. neutralization. The acidity as oleic acid likewise was of little value. Seventeen references are appended. C. R. Fellers

Water in cream. A. F. Lerrigo. *Analyst* **53**, 488–9(1928).—Analysis of 8 samples of cream shows that it is common practice for dairymen in England to dil. cream with 2–30% of water. W. T. H.

Some ice cream problems. A. E. Reynolds. Calif. State Dept. Agr., *Mo. Bull.* **17**, 402–6(1928).—The new Calif. standard for ice cream, *i. e.*, 1.6 lb. food solids per gal., is discussed. Only high-grade gelatin or vanilla ext. should be used in ice cream manuf. C. R. Fellers

Detection and determination of starch in margarine. A. Schmidt. Milchwirtschaft. Inst. für Hannover. *Chem. Ztg.* **52**, 671(1928).—Since July 1, 1915, 2–3% of potato starch can be used instead of 10% of sesame oil to make margarine readily distinguishable from butter. Starch is detected microscopically by treatment of margarine on the slide with tincture of iodine, giving the characteristic blue color. Or the margarine may be melted below 60°, the fat sepd. and the residue tested with tincture of iodine. Sesame oil is tested for by Baudouin's or Soltsien's reactions. To det. starch, melt 100 g. of margarine below 60° in a 200-cc. beaker, remove the melted fat by filtration and washing with Et_2O until the residue and filter are fat-free, and then transfer the filter and contents (albumin, H_2O and starch) to a wide-mouth 100-cc. flask, treat twice with 25-cc. portions of 1% HCl soln., shake thoroughly, and heat in a boiling water bath for 15 min. Add 30 cc. H_2O, cool, add 10 cc. of 4% phosphotungstic acid soln., fill to the mark, shake, filter and polarize. Multiply the Ventzke-polarimeter degrees by 0.346 and calc. thus: Let c = the amt. of starch, α = angle, $[\alpha]_D$ = factor (for potato starch 195.4), l = length of polarization tube in dm.; then $c = 100.\alpha/[\alpha]_D.l$. W. C. Ebaugh

Ripening of cheese of "Sbrinz" type. M. Solari. *Anal. ofic. quím. prov. Buenos Aires* **1**, 107–40(1927).—Analyses of "Sbrinz" cheese were made at intervals during ripening over a period of 11 months. Figures are given of the variation in content of moisture, fat, nitrogenous material (NH_3, amines, sol. and insol. albumins), ash, NaCl, and acidity. A notable feature was the fall of acidity to zero after 4 months, followed by a rapid rise apparently connected with degradation of the fat. NH_3, sol. albumin and amino compds. showed an increase parallel with the degree of ripeness. Lactose had already disappeared when the observations were started. The results are discussed. B. C. A.

Researches on the use of potassium nitrate and nitrite in the curing of meats. Gustav Riess, Rudolf Meyer and Walter Müller. *Z. Untersuch. Lebensm.* **55**, 325–54(1928).—Comprehensive chem. and bacteriol. investigations showed that KNO_3 changes to KNO_2 in meat pickle. The change requires about 3 weeks for completion. By addn. of $NaNO_2$ the curing process is greatly accelerated and the time is reduced from $^1/_2$ to $^1/_4$. The reddening of the meat due to the change of the hemoglobin to NO_2-hemoglobin promotes the penetration of salt into the flesh. The addn. of 0.6% $NaNO_2$ to the NaCl required for the pickle was sufficient for rapid curing. In the outer layers of cured meat 20 mg. $NaNO_2$ per 100 g. of meat was found while in the inner layers the quantity was only 1 to 2 mg. So far as appearance, odor, taste and keeping quality of the cured meats are concerned, $NaNO_3$ is at least the equal of $NaNO_2$. C. R. Fellers

Treatment of meats via the blood stream. A. Gauducheau. *Ann fals.* **21**, 84–90 (1928).—The flesh of chickens, rabbits, pigeons and even sheep can be flavored as required by injecting suitable sauces, etc., directly into the blood stream, through the heart or one of the main arteries, after the animal has been bled. The flesh readily takes up the aroma, and the changes taking place are being studied with a view to the com. application of the technic. A. Papineau-Couture

The differentiation of thawed frozen meat from fresh meat. Anon. *Mitt. Lebensm. Hyg.* **19**, 219–22(1928).—The p_H detn. offers no means of differentiation. The ext. from the thawed meat is usually more turbid than that obtained from fresh meat. The electrolyte content of the exts. cannot be used with certainty as a basis of differentiation. C. R. Fellers

The salmon canning industry. IV. Food value of canned salmon. V. Ernest D. Clark and Ray W. Clough. *Food Manuf.* **3**, 421–3, 460–3(1928); cf. *C. A.* **22**, 2794.—The authors have dealt with the life history of the salmon, methods employed in its capture, the plant, processes used at the Western Canneries, characteristics of the different species of fish, food value of the canned salmon, seasonal prepn. for salmon, regulation and control, economic importance of the industry and scientific investigations in that lab. J. A. Kennedy

A new means of detecting spoiled or worked over nutrient fats. J. Grossfeld. Govt. Food Lab., Berlin. *Z. Untersuch. Lebensm.* **55**, 376–85(1928).—In 2 cases where white grease was worked up with lard, the *caprylic acid value* was, resp., 7.5 and 8.0. Normal lard showed a value of less than 1, but when heated to 150° or over in the presence of air, the caprylic acid value increases considerably. By heating in an atm. of CO_2 or during hydrogenation, no appreciable change was observed. The rancidity of fats is closely associated with their caprylic acid value. The alk. aq. soap solns. of rancid fats decolorize the alk. form of thymolphthalein. By long exposure to ultraviolet light, lard undergoes rancidity as evidenced by the caprylic acid value and Kreiss tests. It is probable that an oxidation deriv. of oleic acid is thus formed. C. R. F.

Artificial coloring of soup pastes. Jose Agell y Agell. *Quim. Ind.* **5**, 161–3 (1928).—Coloring of soup pastes is permitted in Spain, provided the color is harmless and its presence is stated on the package. Only yellow and red are used. *Naphthol, Yellow S* and *Ponceau R.* are permitted in Spain, France and Italy, being originally placed on the list of harmless food colors by the Congrés International pour la Suppression des Fraudes. One % Naphthol Yellow alone or blended with 0.05% Ponceau RR is sufficient. In view of the great no. of harmful products brought on the market under fancy names A. suggests that the purchase and distribution of food colors be delegated to the Natl. Federation of Mfrs. of Soup Pastes, which is to buy on a guarantee of quality and concn. and to analyze the dyes for toxic metals. Mary Jacobsen

The effect of sugar, acid and "set" on the keeping properties of jams. F. Hirst. Campden Res. Sta., Glos. *Food Manuf.* **3**, 447–50(1928).—Expts. were carried out to ascertain (1) what sugar concn. is necessary to prevent fermentation and mold growth, (2) the inhibiting effect of acid on the growth of yeasts and molds and (3)

whether the "set" of the jam plays any part in preventing fermentation. Sep. samples were inoculated with (*a*) *wild yeast* isolated from a fermenting sample of cold process jam and (*b*) the common blue mold, *Penicillium glaucum*. Expts. show that the keeping property of jam depends on sugar, acid and the "set." In a well-set jam, it is difficult for the yeasts to get into the body of the jam, and jams prepd. contg. only 60% sugar, but with a good set, have kept for over 12 months and have shown no signs of fermentation. Sixty-five % sugar is necessary to prevent slight fermentation, if wild yeasts gain access. *Penicillium glaucum* did not grow when the sugar content was 65% or over. Some of these have developed *Penicillium glaucum* when stored in a damp atm. However, jams contg. over 65% sugar are too sweet and tend to crystallize when stored. Acid does appear to have a slight effect on the growth of yeast, but in the strength used (0.5–1%) it has no appreciable effect on the growth of *Penicillium*.
J. A. Kennedy

Commercial tomato preserves. C. Ferri. *Anal. ofic. quim. prov. Buenos Aires* **1,** 141–91(1927).—The chem. and microscopical examn. of tomatoes preserved in various forms is outlined, and a series of representative analyses is given. The essential detns. are of poisonous metals, preservatives, coloring matter and starch. Over 6% of starchy material indicates adulteration, and NaCl over 1% an addn. of salt. Microscopical examn. yields evidence of the efficiency of sterilization and of the presence of other pulps, such as papaw or carrot. B. C. A.

Chemical compositions of the juices of some American apples. Joseph S. Caldwell. U. S. Dept. Agr. *Fruit Products J. and Am. Vinegar Ind.* **8,** 14–8(1928); cf. *C. A.* **22,** 3000.—There is given for each variety of apples the date of picking, date of analysis, reducing sugar, sucrose, total sugar, acid as malic, astringency, tannin, non-tannins, total solids and acid-astringency-sugar ratio. "The analytical results lend confirmation to the conclusion established by previous work that climatic conditions during the period of development and maturity produce consistent and sustained effects upon the chem. compn. of the fruit of apple trees, the character of these effects being that of mass responses given by large groups of trees of dissimilar origin, adaptation to local conditions and character of fruit." "Since the climatic conditions of the yrs. in which the analysis were made are definitely known, and their specific effects upon the compn. of their resp. crops have been detd. for large groups of varieties, any individual analysis has somewhat greater significance than would be the case were it not accompanied by such information. J. A. Kennedy

More products and by-products from the cider mill. Carl R. Fellers. Mass. Agr. Coll. & Expt. Sta. *Fruit Products J. and Am. Vinegar Ind.* **8,** 10–3(1928).—Apple varieties for jelly, the use of culls, extg. and concg. the juice, finishing the jelly, valuable hints on handling and processing the fruit are discussed. J. A. K.

Factors in the preservation of cider. S. Henry Ayers, H. A. Barnby and E. L. Voight. Res. Lab., Glass Container Assocn. *Glass Container* **7,** No. 11, 7–40(1928).—The use of vacuum proved beneficial in reducing mold growth in cider. Yeasts were not affected by vacuum. With 3 heat-resistant species of mold previously isolated from spoiled pasteurized cider, it was detd. that a temp. of 145° F. in the cider for 45 min. or 150° F. for 15 min. would destroy the molds. However, when mold spores were on the inner surface of the neck of the container a temp. of 170° F. for 30 min. was required if the bottles were upright or 165° F. for 30 min. if the containers were placed on their side. Agitation of containers during pasteurization is urged as a possible means of overcoming the cooked taste in pasteurized cider. Bottle caps, steamed for 5 min., were rendered mold free. C. R. Fellers

Processing feeds. A study of certain processes for fermenting or enzymating feeds. A. E. Perkins and C. F. Monroe. Ohio Agr. Expt. Sta., *Bimonthly Bull.* **13,** 163–9 (1928).—Com. processes claiming to break down crude fiber or cellulose into simpler and more useful forms of carbohydrates are shown to be of little or no value in increasing the digestibility of corn stover, straw or hay. The process consists in soaking and steaming the feed, adding a "converter" or diastatic enzyme and maintaining a temp. of from 120 to 160° F. for some time. Chem. and feeding tests on rats, horses and dairy cows failed to indicate any appreciable change in compn. or feeding value. The fiber of feeds is not broken down and any increase in sugar, even when obtained, is offset by a corresponding loss of equally valuable starch. There is no suggestion or indication that any significant improvement occurs in the protein, fat, minerals or vitamins of the feeds treated by the process. C. R. Fellers

Mineral content of pastures. B. C. Aston. New Zealand Dept. Agr. *New Zealand J. Agr.* **36,** 22–7, 75–82(1928).—As a result of 77 analyses of red and white clover and cocksfoot grass pastures on pumice soil A. concludes that there is a serious

deficiency of Fe. The "pining" or nakuruitis disease of sheep pastured on pumice soils is shown to be due to Fe deficiency which can be corrected by iron licks or medicinal treatment with $NH_4FeC_6H_5O_7$. C. R. Fellers

Feeding trials with milch cows using ammonium acetate as a substitute for protein foods in agricultural practice. H. Bareiss. *J. Landw.* **75**, 265-324(1928).—In agreement with the work of Pasch it was found possible to replace 25% of the digestible protein in a ration with NH_4 acetate with no ill-effect on the cow. Normal live-weight increases in the animals occurred. There was a slight decrease in milk yield, but corresponding increase in the fat content. The utilization of NH_4 acetate by the animal takes place in conjunction with the amides present in the other food material. B. C. A.

Behavior of fats and oils in ultra-violet light (Haitinger, *et al.*) **27.** Changes produced in meat extracts by the bacterium *Staphylococcus aureus* (Foreman, Smith) **11C.** Food value of the potato for white rats (Galamini) **11E.** Nutritive value of alba blood as a source of protein (Hauge) **11E.** Apparatus for drying cereals (Brit. pat. 283,717) **1.** Albuminoids (Brit. pat. 283,866) **17.** Paper pulp [feeding stuff produced in manufacture of] (Brit. 283,857) **23.**

Flour. Cornelius Massatsch and Eugen G. Cluss (to Matro G. m. b. H.). Canada 282,505, Aug. 14, 1928. A flour suited for human food and for dietetic purposes is prepd. from root germs of grain or maize from malting processes by treating the germs preliminarily at a mild heat with a quantity of a dil. alkali soln. (potash or caustic alkali) corresponding to the soaking capacity of the germs, removing the germs from the liquid, drying and grinding them to a powder or flour and mixing this flour with another flour or other addns.

Milk treatment. Alfred W. Bosworth and Lewis H. Chrysler (to A. W. Bosworth). Can. 282,737, Aug. 21, 1928. Part or all of the Ca is removed from the milk, by removing the fat from the milk, then adding a substance contg. the phosphoric acid radical in amt. insufficient to coagulate or ppt. the casein, rendering the milk slightly alk. (by addn. of soda, potash or ammonia either caustic or carbonate) whereby the Ca present is converted into insol. Ca phosphate, which is pptd. in the form of a gel and sepd. by filtration or centrifugation, and thereafter neutralizing any undesired excess of alkali in the milk.

Packing acidophilus milk powder. Raphael S. Fleming (to Merrell Soule Co., to The Borden Co., to Merrell-Soule Co., Inc.). Can. 282,507, Aug. 14, 1928. Acidophilus milk powder packed in cans is subjected to vacuum immediately after production to reduce the free or uncombined O in the cans to less than 5 cc. per lb. of powder and preferably less than 3.5 cc. and the cans are then charged with a gas, as CO_2 or a combination of gases as CO_2 and N, which do not contain free or uncombined O and thus preserve the *Bacillus acidophilus* organisms. Cf. *C. A.* **22,** 286.

Separating butter fat from buttermilk and buttermilk whey. Arthur L. Rushton (one-half to Munson H. Lane). U. S. 1,683,728, Sept. 11. Material such as sour cream buttermilk is treated with a reagent such as NaCl or NaOH which materially reduces the clogging tendency of casein in the buttermilk when centrifuged and is then centrifuged in a cream separator for a longer time than required in ordinary cream sepn.

Recovering butter fat from buttermilk. Arthur L. Rushton (one-half to Munson H. Lane). U. S. 1,683,729, Sept. 11. Buttermilk or buttermilk whey is subjected to a centrifugal sepn. at approx. the same speed that is used for sepg. cream from whole milk and the fluid recovered from the cream outlet of the separator is then subjected to another sepn. by passing it through a cream separator at a lower rate than used in treating whole milk; "buttermilk cream" is recovered from the cream outlet and is churned to make butter.

Ice cream. James R. Hatmaker. U. S. 1,684,094, Sept. 11. A portion of a given quantity of natural whole milk is dried and the dry solids thus obtained are then incorporated with the remainder of the original quantity of milk, and mixed with addnl. cream and stabilizing and flavoring substances, to form a mixt. for making ice cream.

Treating cereals. Ludwig Bartmann (to The Treuhand-Ges. m. b. H. Bartmann & Co.). Can. 282,539, Aug. 14, 1928. The grains of the cereal are steeped at 30-40° in H_2O until the endosperm has become soft and pasty while the layers surrounding the same have assumed a tough and leather-like character. At the same time grains are treated with CH_2O to paralyze the germs of embryos and thereafter pressure is applied

to cause the outer layers to burst and the endosperm to be expelled in a substantially pure state. Cf. *C. A.* **22**, 3243.

Composition for preserving eggs. HENRY STANLEY. U. S. 1,683,631, Sept. 11. A mixt. adapted for coating the shells of eggs is formed from wheat bran 92.76, NaCl 7.01 and mineral ocher 0.23%.

Preserving meat. W. H. HOBBS and A. LANE. Brit. 283,626, Oct. 11, 1926. Meat is stored in a closed chamber at a temp. of about 0° in air of a humidity of 62–66% which had been bubbled through a soln. of thymol in HOAc. The meat may be preliminarily washed with HOAc soln. An app. is described.

Preserving fish and other animal foods by packing in moistened sphagnum. W. K. GÜNTHER. Brit. 284,130, June 7, 1927. Salt water may be used for dampening the sphagnum.

Drying plant for fish and other foods. L. S. TOFTDAHL. Norw. 44,176, June 27, 1927. Mech. features.

Pectin. A. LEO. Brit. 283,657, Oct. 18, 1926. A sol. compn. for jellifying jams, jellies, fruit juices, etc., is made by treating pectin or a pectinous material with citric acid or other suitable weak edible acid and partially neutralizing (preferably with $NaHCO_3$) so that gas is evolved which assists in the soln. of the pectin.

Desiccating fruit juices, etc. E. JAMESON, E. D. STEWART and C. P. WILSON (to California Fruit Growers Exchange). Brit. 283,579, Jan. 15, 1927. A product in powd., granular or flake form is prepd. by spray desiccation of juices such as those of oranges, lemons or grape fruit admixed with lactose, with or without addn. of other sugars. Brit. 283,580 specifies admixing the juice with colloids such as pectin, agar or gelatin, with or without lactose or other sweetening or flavoring substances, and spray desiccating the mixt. Brit. 283,581, C. P. Wilson and E. D. Stewart (to California Fruit Growers Exchange) specifies spray desiccation of mixts. of fruits juices with milk.

Apparatus for concentrating fruit juices. ARNOLD BECKE. Austrian 108,689, Sept. 15, 1927. Hot air is bubbled through the juices and a steam-heated coil is arranged in the air space above them.

Separating thistle buds from peas by flotation in a hot water bath. OGDEN S. SELLS (to Sprague-Sells Corp.). U. S. 1,683,703, Sept. 11.

Cattle food. PHILIP R. PARK (to The Park and Pollard Co.). Can. 283,290, Sept. 11, 1928. A cattle food contains a cereal body and dried fish scrap having I-bearing oil dispersed therein in growth-stimulating proportions.

Fodder. ALBERT E. KIENZLE (to Soc. anon. des Bières Bomonti et Pyramides). Can. 282,526, Aug. 14, 1928. An animal fodder contains 50% Indian corn-cob flour to 50% sugar-cane flour (coarse) with the exclusion of fine sugar cane flour dust. Cf. *C. A.* **22**, 2220, 3003.

Cattle fodder. EMIL R. J. SCHRÖDER. Norw. 44,411, Sept. 26, 1927. Two parts of fresh ground sea-weed are mixed with 1 part of waste flour and the mixt. is stirred with water of 70° to a stiff pulp. After being stored for 5 hrs. the mass is pressed and dried to fodder cakes or the pulp is passed through a rotary drying cylinder and ground to fodder meal.

13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

Research and chemical industry. FRANCIS H. CARR. *J. Soc. Chem. Ind.* **47**, 249–55T(1928).
E. H.

Research and profits. C. S. MINER. Miner Labs., Chicago. *Ind. Eng. Chem.* **20**, 1069–71(1928).
E. H.

The industrial applications of ultra-violet rays. J. J. TRILLAT. *Science & industrie* **12**, No. 168, 27–32(1928); cf. *C. A.* **21**, 3018.
E. H.

Seventh (French) congress of industrial chemistry. MAURICE DESCHIENS. *Chimie et industrie* Special No., 1–72(April, 1928).—A detailed account of the proceedings.
A. PAPINEAU-COUTURE

The problems of the organic chemical industry. H. E. FIERZ-DAVID. École Polytechnique, Zurich. *Chimie et industrie* Special No., 109–20(April, 1928).—An address indicating the directions in which various branches of the org. chem. industry are developing.
A. PAPINEAU-COUTURE

Crystallization from quiet and from agitated solutions. KARL KIEFER. *Chem. App.*

15, 185–6(1928).—A discussion of the currents in crystg. solns. caused by difference in temp. and d. due to deposition of crystals. With quiet solns. it is of the utmost importance to find the most suitable d. for the production of the largest amt. of wall crystals. With agitated solns. the d. must be found at which the so-called "growth curve" runs parallel with the "deposition curve." This point differs with every soln. and must be detd. by expt. The temp. drop in the crystallizer by which the curves run parallel differs with most solns., being about 5° with some, and to get the best results large vols. of soln. should pass through the crystallizer. Methods for the detn. of these curves are not given. J. H. MOORE

Distillation and rectification under reduced pressure and their applications. A. FICHOUX. *Chimie et industrie* Special No., 292–307(April, 1928).—A discussion of accepted exptl. facts and present-day theories with examples of their application for the selection of the most suitable type of equipment under given conditions (dyestuffs intermediates industry, petroleum products, recovery of C_6H_6 or gasoline from scrubbing oils, recovery of glycerol from distillery vinasses, rectification in vacuum of mixts. which are azeotropic at atm. pressure). A. PAPINEAU-COUTURE

Investigation of the capacity of the evaporating surface and the steam space of steam boiler and evaporating apparatus. CHR. EBERLE. *Arch. Wärmewirt.* 9, 282–3 (1928).—The quality of the steam produced by a boiler at pressures from 1 to 10 atm. was found to depend on the vol. of steam evolved per hour, not on its wt. The moisture in the steam became appreciable at a certain crit. vol., and rose rapidly and linearly thereafter. ERNEST W. THIELE

A method for determining the percentage of water in steam. ROBERT AVICE. *Rev. agr. Maurice* 5, 124–5(1928).—A sampling pipe of 1 in. diam. and perforated in several places is mounted into the steam line in such a way that samples may be taken at any desired moment. A weighed quantity of H_2O is placed in a convenient receptacle, and the steam from the sampling pipe passed through it for several min. The receptacle is reweighed, and the % of dry steam q may be calcd. from the following formula: $W(T_2 - T_1) = W_1(qL + (T_3 - T_2))$, where W is the original wt. of the H_2O, W_1 the wt. of the condensed steam, T_1 the initial temp. of the H_2O, T_2 its final temp., T_3 the temp. of the steam, and L the latent heat of the steam. For greater accuracy, the heat absorbed by the receptacle must also be considered; then the formula changes to: $(W + SW_2)(T_2 - T_1) = W_1(qL + (T_3 - T_2))$, where W_2 is the wt. of the receptacle, and S the sp. heat of the material from which it is made. A "Throtting Calorimeter" may be used for the same purpose as the method described, but it is expensive. F. W. ZERBAN

New Jersey's experience with benzene poisoning. ANDREW F. MCBRIDE. *Am. Dyestuff Rept.* 17, 558–60(1928).—Chronic poisoning may occur among workmen exposed to atms. contg. as little as 1 part C_6H_6 in 10,000. The practical directions, for avoiding chronic C_6H_6 poisoning, formulated by the Industrial Poisons Comm. of the Nat. Safety Congress, are quoted. So far as possible toluene, xylene, Et acetate and other relatively harmless solvents should be substituted for C_6H_6. L. W. R.

Kraemer-Sarnow method [for determining the softening point of pitch] and mercury poisoning. H. MALLISON. *Z. angew. Chem.* 41, 839–40(1928).—The danger of chronic poisoning by prolonged contact with Hg has been pointed out by Stock and others; it is therefore suggested that the Hg method of detg. the softening point of pitch should be universally replaced by the American "ring and ball" method. B. C. A.

Physiology of breathing in industrial masks. I. The comfort of the individual in the use of masks. E. HÖRNICKE AND O. BRUNS. Univ.-Poliklinik zu Königsberg. *Z. ges. exptl. Med.* 56, 98–117(1927).—Masks with the canister attached direct, and with the canister connected to the mask with a tube were studied. The pressure variation due to the filter increased with usage and varied with different individuals but had no serious effects. Increasing the dead space increased the min. vol. both in rest and during activity. There were no serious changes in pulse or blood pressure. The discomfort is related to the amt. of dead space. F. L. DUNN

Modern methods of insulation. I. S. CAMMERER. *Chem. Fabr.* 1928, 341–2.—Approx. data are given for the economical degree of insulation for varying pipe diams. and temp. differences. For the accurate detn. of the efficiency of insulating materials the Schmidt method employs an auxiliary surface consisting of a rubber sheet of given dimensions provided on both surfaces with a large no. of thermoelements. This is laid on one side of the material to be tested. A recording millivoltmeter is of great assistance, providing a continuous record of heat loss. B. C. A.

Insulation against heat and cold. I. S. CAMMERER. *Chem. Fabr.* 1928, 318–20.—Estimates of thermal losses from steam pipes, etc., with and without insulation are

given. All insulating materials depend for their properties on a porous structure with air spaces, but if such spaces are not quite small convection currents are set up. Qualities desirable for insulating materials for various purposes are described. While a variety of inorg. and org. materials are used for heat insulation, only cork and peat have hitherto found much application for cold-storage insulation. Practical tests are particularly valuable in choosing an insulating material. B. C. A.

The mechanism of exchanges in distilling and rectifying equipment (MARILLER) **2.** Graphical method for determining the course of the natural distillation process (BRANDES) **2.** Glass [for insulating purposes] (U. S. pat. 1,684,332) **19.** Synthetic resins [for insulating] (Brit. pat. 283,803) **26.**

Pitman's Technical Dictionary of Engineering and Industrial Science, in Seven Languages—English, French, Spanish, Italian, Portuguese, Russian and German. In 2 parts, edited by Ernest Slater. London: Sir Isaac Pitman & Sons, Ltd. Part I and Part II each 2s. 6d. Reviewed in *J. Roy. Soc. Arts* **76,** 982; *Intern. Sugar J.* **30,** 496(1928).

HALE, HARRISON: **American Chemistry.** 255 pp. $2.50. Copies can be obtained from Textile Colorist, Inc., New York City, N. Y. Reviewed in *Textile Colorist* **50,** 629(1928).

LABOUREUR, M., AND PÉPIN-LEHALLEUR, J.: **Cours de chimie. II. Chimie Minérale industrielle. Analyse Minérale industrielle.** Paris: Ch. Béranger. 557 pp. F. 57.

Purifying distillation gases. J. BECKER (to Koppers Co.). Brit. 283,948, Jan. 22, 1927. Fouled purifying material such as that used in treating gases from coke ovens employed in connection with a steel plant is regenerated by treatment with combustible gas, *e. g.*, a portion of the purified gas, which may then be burnt under the coke ovens. Various app. and details are described. Cf. *C. A.* **22,** 1814.

Carrying out gas reduction processes. EMIL EDWIN. Norw. 40,145, Dec. 27, 1927. Steam is added to the gas and its content of CO is partly or completely converted into CO_2 and H_2. Or, only a part of the total circulating gas quantity is taken out and subjected to the said treatment and again returned into the process. The CO_2 formed is recovered.

Closed-circuit system for adsorbing and subsequent recovery of gases or vapors. NORIT-VEREENIGING VERKOOP CENTRALE. Brit. 283,508, Jan. 11, 1927. An app. is described.

Recovering volatile solvents. HERMANN BOLLMAN. Ger. 451,906, Nov. 21, 1927. Volatile solvents such as C_6H_6, benzine, ether and alc. are recovered from mixts. of the solvent vapor and air by atomizing the mixt. together with a fatty oil or fatty acid into a cylindrical container provided with a tangential atomizer. The droplets of oil carried along with the liberated air are pptd. by causing the air to pass out over a helical baffle. The solvent is then distd. from the oil or acid.

Boiling down liquids evolving volatile constituents. AKTIENGESELLSCHAFT KUMMLER & MATTER. Ger. 451,973, Nov. 21, 1927. Liquids such as *sulfite liquor* are concd. by condensing the vapors and again using the condensed vapors as dry steam, which is sprayed into the heating chamber together with an excess of finely divided hot water. Condensate from the heating chamber may be used as the hot water.

Colloidal suspensions. A. BIDDLE. Brit. 283,686, Nov. 15, 1926. See Can. 270,571 (*C. A.* **21,** 3430).

Refrigerating apparatus of the continuous-cycle absorption type. PLATEN-MUNTERS REFRIGERATING SYSTEM AKTIEBOLAG (to Electrolux, Ltd.). Brit. 283,937, Jan. 20, 1927.

Refrigerating apparatus of the absorption type. A. LENNING (to Electrolux, Ltd.). Brit. 283,473–4, Jan. 8, 1927. Structural features.

Refrigerating apparatus of the absorption type. A. LENNING (to Electrolux, Ltd.). Brit. 283,938, Jan. 20, 1927. Structural features.

Refrigerating apparatus of the absorption type. STUART OTTO (to Iceless Automatic Refrigerator Co.). U. S. 1,684,196, Sept. 11. Structural features.

Refrigerating apparatus of the absorption type. IVAR AMUNDSEN. Norw. 44,261 and 44,262, Aug. 1, 1927. The cooling is produced by means of an active gas-adsorbing substance which alternately adsorbs and gives off the cooling fluid, which may be a gas or a liquid. The active substance can be silica gel, bleaching earth or active carbon,

a suitable substance being animal carbon from bones or blood for instance the Merck's Carbo Medicinalis. The cooling fluid can be NH_3, SO_2, CH_3Cl, C_2H_5Cl or an alc., preferably methanol or ethanol.

Controlling the hardness of baked insulating material such as enamel on wire. EGIDIO E. MANESCHI (to Western Elec. Co.). U. S. 1,683,833, Sept. 11. The amount of baking to which the material is subjected is regulated in accord with a detn. of dielec. losses in the material when subjected to an alternating electrostatic field. An app. is described.

Insulating material. JOSEPH M. COFFEY (to The Mica Insulator Co.) Can. 283,428, Sept. 18, 1928. An insulating material is composed of thin mica splittings and phenol-glycerol resin binder in the proportion 95 and 5% by wt. The material when hot is capable of being molded into shapes and retaining such shapes when cooled.

Heat-insulating material. WILLIAM K. NELSON (to Insulex Corp.) Can. 283,061, Sept. 4, 1928. A heat-insulating material of cellular texture contains 2 lb. calcined gypsum, 3 oz. $Al_2(SO_4)_3$, 1.5 oz. $CaCO_3$, 4 g. soap, 8 g. talc, finely ground and thoroughly mixed and having added thereto 26 liquid oz. H_2O. The CO_2 evolved within the mass forms a bubble-producing medium. Cf. *C. A.* **22**, 3006.

14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

Sixty-first annual report of the Commissioners of Water Works in the City of Erie, Pa., for year ending December 31, 1927. 84 pp.—Extensive tabulations of financial data and operating statistics are given. Av. daily consumption during the year was 24,088,683 gallons, equiv. to 192.7 gallons per capita to estd. population supplied of 125,000. The cost of collecting, purifying and distributing the water, including depreciation, was $23.168 per million gallons. The amt. of water pumped per lb. of coal consumed averaged 279 gallons. The av. amts. of alum and hypochlorite used were 0.145 grains per gallon and 3.1 lb. per million gallons, resp. The wash water averaged 1.82% of the water filtered. Of 300 1-cc. samples of raw water examd. for *B. coli*, 63 showed positive results, while of 599 10-cc. samples of filtered water examd. none contained the colon bacillus. A brief description of the water-purification works is included. R. E. THOMPSON

The design and equipment of water-works laboratories. MELVILLE C. WHIPPLE. *J. New Eng. Water Works Assoc.* **42**, 339–55(1928).—Detailed suggestions, including location, layout of space, equipment, app. and library. D. K. FRENCH

Present practice in water-meter construction. DENKERT. *Gas u. Wasserfach* **71**, 778–84, 804–9(1928).—Present-day construction of water meters, resistance to corrosion and materials of construction as well as the working range of German water meters are discussed in detail, with illustrations. R. W. RYAN

The role of water in hygiene. F. BOURGUIN. *L'Eau* **21**, 92(1928).—A general presentation. C. R. FELLERS

The chemico-sanitary investigation of water with regard to organic substances. L. M. HOROWITZ-WLASSOWA, A. M. AND F. M. GOLDENBERG. *Arch Hyg.* **98**, 234–40 (1927).—An investigation was made of river water, of infusions of dry and green leaves, and of various solns. of proteins, fats and carbohydrates. Similar values obtained by Kubel's reaction for the oxidizability of the solns. did not correspond to identical content of organic matter. A 0.01% soln. of glucose takes up in 10 min. only 75% of the calcd. amt. of O; peptone under the same conditions scarcely 25.5%. The method of Fowler is of greater value from a sanitary point of view, since org. material of animal origin is more rapidly detd. by this method. P. Y. JACKSON

Bacterial results following a failure to sterilize new water mains. W. M. OLSON AND H. L. WRIGHT. *J. Am. Water Works Assoc.* **20**, 229–33(1928).—While no serious disease followed, the water was complained of as undrinkable, and bacterial count was very high. D. K. FRENCH

The d'Herelle bacteriophage in drinking water. PAUL FABRY. *Rev. Hyg. Med. Prev.* **50**, 667–71(1928).—The presence of the colon bacillus in water must be considered with suspicion. On the other hand its absence may not indicate pure water because the organism may have undergone lysis by the bacteriophage and could not be recovered by ordinary lab. methods. If a bacteriophage is found in water, this may indicate, *per se* intestinal pollution. C. R. FELLERS

Water-supply struggles of a small southern city. PRESON P. PHILLIPS. *Eng.*

News-Record **101**, 361–3(1928).—The recently completed water works of Mount Airy, N. C., treating water drawn from Lovill's Creek, consists of a mixing chamber, 2 coagulation basins, three 0.5-million gallon rapid sand filters and a 0.5-million gallon clear well. The plant, which is of 1.5-million gallons capacity, will provide 200 gallons per capita daily to the present population of 7500. The mixing basin, which is of the over-and-under baffled type, provides a retention period of 15 min., and the 2 coagulation basins 5 hrs. The cost of the plant was approx. $140,000. R. E. THOMPSON

Conserving water supply at Springfield, Mo. WM. J. GRAY. *Eng. News-Record* **101**, 128(1928).—Waste reduction activities in Springfield are outlined. The water supply is at present derived from springs and wells, and an impounding reservoir is under construction on the North Sac River. The purification plant consists of a sedimentation basin, an 8-million-gallon filter plant and chlorination app. R. E. T.

Expansion of the municipal waterworks at Bologna. A. NATALE. *Gas. u. Wasserfach* **71**, 799–804(1928).—Details of the expansion of the Bologna waterworks are given and especial attention given to the methods of adding lime and alum as well as filtering. R. W. RYAN

The water supply of Caracas, Venezuela. THORNDIKE SAVILLE. *J. New Eng. Water Works Assoc.* **42**, 303–38(1928).—The present supply is from rivers and creeks. *B. coli* are practically always confirmed in supply samples and the water at no time would pass the U. S. Pub. Health Standards. Sterilization following sedimentation has been recommended. D. K. FRENCH

Some recent improvements in the softening of natural waters. P. PATIN. *Chimie et industrie* Special No., 158–62(April, 1928).—A description and discussion of water-softening by means of base exchange with artificial zeolites. A. PAPINEAU-COUTURE

Water softeners and water softening. W. L. ASHMAN. *Gas. Eng.* (London) **44**, 42; *J. Am. Water Works Assoc.* **20**, 157.—A general résumé from the impurities causing scale to the latest methods of removal. D. K. FRENCH

An outline of water softening. J. F. PIERCE. *Am. City* **30**, No. 3, 90–1(1928).—The zeolite process is outlined, with particular reference to its applicability to small community softening problems. E. M. S.

The filtration and treatment of water for domestic purposes. ALEXANDER C. HOUSTON AND HENRY E. STILGOE. *Water and Water Eng.* **30**, 357–62(1928). J. A. KENNEDY

Filter operation at variable rates. HARRY N. JENKS. *J. Am. Water Works Assoc.* **20**, 214–9(1928).—Overloading shortens the possible hrs. of operation of the filter because of premature clogging, but within proper limits operation at variable rates does not impair the quality of the effluent. Beyond fairly well-defined limits, however, overloading results in a marked decrease in efficiency. D. K. FRENCH

Filterplant troubles traced more often to faulty design than to poor operation. C. A. BROWN. *Hydraulic Eng.* **4**, 89, 102–4; *J. Am. Water Works Assoc.* **20**, 159 (1928).—The ideal plant is suggested and described. D. K. FRENCH

Zeolite filter plant of Ohio Valley Water Company, Bellevue, Pa. A. H. KNEEN. Pa. Water Serv. Co., Wilkes-Barre. *Ind. Eng. Chem.* **20**, 951–3(1928).—The wells are located in the gravel deposits of the Ohio River. The well water is clear and ample in quantity, but is hard and contains Mn and *Crenothrix*. The capacity is about 6 m. g. d. Complete details for the 4-unit softening plant and its operation are given. J. A. KENNEDY

Chemical handling and control of the Baltimore filters. JAMES W. ARMSTRONG. *Eng. News-Record* **101**, 65–6(1928).—The methods of chem. control employed at the Montebelo filter plants, Baltimore, are described. The new and old plants, of 128 and 112 million gallons capacity, resp., adjoin each other. Alum is used as coagulant and is manufactured at the works from bauxite and H_2SO_4. The process employed is outlined and the automatic app. used for controlling the application of the resulting alum soln. to the water is described. Lime is added to the filtered water to reduce CO_2 and prevent corrosion, the amt. required being detd. by the p_H value of the water. The control app. is similar to that employed for the alum. R. E. THOMPSON

Experiences with the Norit filter in tropical countries. J. W. WOLFF. *Geneeskund. Tijdschr. Nederland. Indië* **68**, 171–82(1928); cf. Wolff, *Centr. Bakt. I. Orig.* **101**, 163(1927).—When used for the filtration of clear well water the Norit filter yielded sterile water at a rate 1–2.5 l./hr. One Norit filling may last 6 months. Turbid, heavily contaminated river water soon clogs the pores of the chamber which serves for the retention of the coarse impurities. MARY JACOBSEN

New pumping and filtration plant for Knoxville water works. CHAS. B. BURDICK. *Eng. News-Record* **101**, 204–7(1928).—An illustrated description of the new Williams

Creek plant treating Tennessee River water. The population supplied is 100,000 and the consumption 9 million gallons per day. The plant consists of two 36-in. intake pipes, 2 circular mech. mixing chambers, 2 coagulation basins providing 6 hrs.' retention at the rated capacity of 15 million gallons per day, and six 2.5-million-gallon rapid sand filters. Alum and occasionally lime are employed in treatment. R. E. T.

Filter plant provides public square and bath houses. PAUL HANSEN. *Eng. News-Record* **101**, 87–8(1928).—An illustrated description of the new water-purification plant at Kenilworth, Ill., on Lake Michigan. It replaces the old pressure filters, which did not at all times effect satisfactory removal of turbidity. The plant, which has a nominal capacity of 1 million gallons per day, consists of mixing and coagulation basins, 2 filters and clear well. Provision was made for a 30-min. mixing period to facilitate removal of the microörganisms that occur in the lake water in certain seasons. The population is 2500. R. E. THOMPSON

Effect of liquid-chlorine application to trickling filters. T. C. SCHAETZLE. *Bull. Md. State Dept. Health* **1**, 87–96(1928); *Pub. Health Repts.* **43**, 2285–6(1928).—The settled sewage flowing to a trickling filter located in the suburbs of Baltimore was chlorinated to det. the effect upon the *Psychoda* the trickling-filter fly, which was present in large nos. in the filtering material, and to ascertain the resulting effect upon the nitrifying powers of the trickling filter of such chlorination. Cl doses of from 5.0 p. p. m. and 10.0 p. p. m. were used. Such chlorination did not destroy the larvae of *Psychoda*, although the adult fly was killed by direct contact with the chlorinated sewage. The chlorination of the sewage resulted in the removal of the growth of the stones in the immediate vicinity of the nozzles. Very little reduction in the nitrifying power of the bed was observed during 5.0 p. p. m. dosing and a greater but not abnormal denitrification resulted during the application of 10.0 p. p. m. Cl. The nitrifying powers of the trickling filters began to return to an approx. normal condition within about 4 hrs. after the Cl application was stopped. The filter effluent contained residuals of between 0.2 p. p. m. and 1.33 p. p. m. Cl, during 1 complete cycle of the dosing siphon. C. R. FELLERS

Influence of free chlorine on the elimination of manganese from water. O. WEBER. *Chem.-Ztg.* **51**, 794–5(1927).—The elimination of Mn from H_2O by aeration and filtration of the oxidized Mn compds. depends not so much on chem. action as on biol. influence. Tabulated results from a waterworks in Hanover show that the Mn content is not lessened by aeration and filtration when free Cl is added to the raw water; considerable improvement is seen when the Cl is added after filtration, but the Mn is entirely eliminated only when unchlorinated raw water is used for washing the coke filters. A filter requires time to attain its highest efficiency, and its MnO_2 content is important. B. C. A.

Water sampler for the determination of dissolved oxygen. JACK J. HINMAN, JR. *J. Am. Water Works Assoc.* **20**, 253–6(1928).—A very clever and seemingly foolproof device is described. The sampling bottle passes more than 10 times its capacity before the device stops operating. D. K. FRENCH

Biochemical oxygen demand. LEROY FORMAN. *Public Health News N. J. State Dept. Health* **13**, 132–6(1928); *Pub. Health Repts.* **43**, 2227–8(1928).—Several series of expts. were made in an attempt to secure uniform and consistent results in the detn. of biochem. O demand. Tests were made to det. the effect of using different temps. for aeration of dilg. H_2O, the effect of aging dilg. H_2O, the temp. of incubation, the effect of using distd. or Trenton tap water, and the effect of adding salts to increase the p_H. Some of the conclusions are: That all factors must be controlled; aged tap water is satisfactory at any one plant, but for comparison of results with other plants a uniform dilg. water is necessary; the nature of the material is considered a less important factor than formerly; the greatest factor for obtaining good results in detns. of biochem. O demand are (1) mineralized water, preferably with potash salts, with a p_H well on the alk. side; (2) well aged dilg. water and (3) incubation at a uniform temp. and not below 20°. A modified procedure adopted by the New Jersey State Department of Health is presented. C. R. FELLERS

Titration of carbon dioxide in water. L. SMITH AND G. WODE. *Z. angew. Chem.* **41**, 208–12(1928).—See *C. A.* **21**, 3997–8. H. G.

Determination of available sulfur in mineral waters. CHARLES LEPIERRE. Inst. Sup. Technique et Inst. d'Hydrologie, Lisbonne. *Chimie et industrie* Special No., 131–2(April, 1928).—Available S is defined as that present as H_2S, XHS or X_2S. Because of lack of sensitiveness of ordinary methods of detn., absence of available S has often been reported in mineral waters in which it could be detected by smell. Detn. by production and colorimetric detn. of *thionine* gives accurate results for amts. varying

from a few mg. to a few 0.01 mg. S per l. The following technic is recommended: to a suitable amt. of water (up to 2 l.) add 1 cc. concd. HCl, then 0.05 g. *p*-phenylenediamine, and finally 0.2 cc. of 10% $FeCl_3$, mix, heat to about 60°, let stand until the color has reached max. intensity (about 15–20 min.) and compare with a standard thionine soln. Commercial thionine can usually be used for prepg. the standard soln.; but if the shade differs appreciably from that obtained with the sample, a soln. of H_2S should be standardized iodometrically, suitably dild. and treated as above. The reaction is specific, being unaffected by sulfites, thiosulfates or the alky. of the water.

A. PAPINEAU-COUTURE

Stuart, Florida, iron-removal and pumping station. P. P. DEMOYA. *J. Am. Water Works Assoc* **20,** 244–52(1928).—Aeration to reduce CO_2 and upward filtration through gravel is considered to give a satisfactory water. The plant and the theory of operation are described fully. D. K. FRENCH

Coördination of biological and chemical work in the investigation of polluted waters. DAVID ELLIS. *Ind. Chemist* **4,** 291–4(1928).—The chemist's field and the bacteriologist's field in the examn. of drinking water are sep. and distinct. The albuminoid-NH_3 test does not always show a correlation with the no. of bacteria. This is the case also with the "oxygen absorbed." Black mud is not necessarily an indication of sewage pollution. Bacteria in the black mud of the Clyde liberate H_2S which produces black FeS from the Fe compds. present. This black mud continues far beyond the zone of any possible sewage contamination. *Cladothrix dichotoma* and *Crenothrix polyspora*, members of the group of iron bacteria, may cause a reservoir for weeks on end to resemble a muddy, dirty pond. They flourish best in water from boggy or marshy ground. If present, the gathering ground for the water needs attention. E. G. R. ARDAGH

Economical treatment of swimming pool waters. LEWIS O. BERNHAGEN. *Proc. 10th Texas Water Works Short School* **1928,** 150–5; *Pub. Health Repts.* **43,** 2226(1928).—There is a discussion of the 3 general types of pools, namely, the fill-and-draw, the flowing-through, and recirculation pools At Beaumont, Tex., water was supplied to a flowing-through pond by a well at slightly less than 5¢ per 1000 gals.; air-lift pumping equipment was used, air being supplied by a compressor operated by a 20-h. p. motor with power cost of 3¢ per kw. hr. However, as most wells put down at a moderate cost cannot be depended upon for an unfailing supply, a hypothetical example of comparative costs for a 600,000-gal. pool is worked out, with itemized estimate of initial cost and operation of recirculation pool with filtration and disinfection, and operating cost of flowing-through pool. It is estd. that the former will give a 51% return on the initial investment of $6500 over that of the latter method. The enforcement of soap and water cleansing of bathers prior to use of a pool, the importance of water temp. not exceeding 72° F., and the advantages of Cl compds. over ultraviolet ray disinfection are pointed out. C. R. FELLERS

Adaptability of sodium aluminate in water treatment. P. W. EVANS. *Proc. 10th Texas Water Works Short School* **1928,** 134–42; *Pub. Health Repts.* **43,** 2291(1928).—Four main advantages are given, as follows: (1) Increased plant capacity or output due to more rapid clarification of settling; (2) less causticity, which should, in turn, result in reduced trouble from foaming; (3) the avoidance of the increase of alkali sulfates in treated water, resulting from the use of either alum or copperas; (4) the elimination or material reduction in the amt. of after-ppts. which will result in (*a*) reduced trouble of pipe lines, heaters, branch pipes and injectors becoming clogged; (*b*) a material reduction in foaming troubles; (*c*) a decided reduction in the no. of boiler washings. Chem. reactions involved are discussed at length. C R. FELLERS

Treatment of Missouri River water for locomotive use. H. H. RICHARDSON. Mo. Pac. R. R. Co., St. Louis. *Ind. Eng. Chem.* **20,** 924–5(1928).—Lime-soda ash water-softening plants have been installed at 10 points where Mo. River water is used. Untreated city water is being used at 3 other points. Na aluminate is used in all but 2 of the plants where the water is being treated. Statistics and further details of operation are given. J. A. KENNEDY

Progress report of the boiler feed water studies committee. *Fuels and Steam Power, Am. Soc. Mech. Eng. Trans.* **50,** 213–4(1928).—Formerly feed water treatment meant only removal of scale. Such equipment is now in use. Deaeration minimizes corrosion troubles in boilers, but corrosion in the absence of O_2, formation of H_2 and O_2 by direct ionization of pure H_2O, embrittlement of boilers at relatively low pressures, are new problems brought up by recent developments. E. M. SYMMES

Modern practice in boiler feed-water purification. G. E. FOXWELL. *Gas World*

89, Sept. Coking Sect. 10–4(1928).—A review and discussion of causes and methods of prevention of scale and corrosion. F. S. GRANGER

Lime-soda diagram as aid in feed-water treatment. I. W. ARBATSKY. *Warme* **50,** 329–53; *J. Am. Water Works Assoc.* **19,** 230(1928).—Hardness tests and titrations often give misleading information as to the completeness of a feed-water treatment. Naming as "unripe" a water where reactions are deferred or incomplete, A. discusses every phase of its proper treatment. There is also described a calcg. device for lime-soda requirements as well as a quick volumetric and colorimetric method of testing. D. K. FRENCH

Elimination of oil from boiler feed water. C. N. RIDLEY. *Eng. and Boiler House Rev.* **41,** 374–6, 378; *J. Am. Water Works Assoc.* **20,** 158(1928).—After describing the mechanism of oil contamination reference is made to methods of removal, including mech., chem. and elec. D. K. FRENCH

The effect of industrial wastes on boiler-feed water problems and condenser operation. V. B. SIEMS. *Fuels and Steam Power, Am. Soc. Mech. Eng. Trans.* **50,** 223–5 (1928).—New treatments of feed water are I recarbonation of chemically softened water, II use of SO_2 for decolorization and assisting coagulation, III use of Na_2SiO_3 to stop corrosion. I is a means of preventing deposition of $CaCO_3$ in mains and incrustation of sand grains of filters where lime-soda softening is used. CO_2 gas is diffused through the water to form bicarbonates, the Ca bicarbonate dissolving. This is of use in public water supplies but is objectionable for boiler use. II has some use, but its effect on boilers has not been detd. III is applied to prevention of corrosion by brine solns. in refrigeration. In waters it would form the very harmful Ca silicate. E. M. SYMMES

Theoretical and experimental studies on the scaling of boilers. R. STUMPER. *Chimie et industrie* **20,** 10–20(1928); cf *C. A.* **21,** 3998.—A critical review of the work done on and theories proposed to explain the mechanism of the formation of boiler scale, particularly from the standpoint of the physicochem. laws governing the formation of a solid phase in solns. A. PAPINEAU-COUTURE

The heat conductivity of boiler scales. CHR. EBERLE AND CL. HOLZHAUER. *Arch. Wärmewirt.* **9,** 171–9(1928).—Heat cond. tests were made on dry compressed powders of varying densities, composed mainly either of SiO_2, $CaCO_3$ or $CaSO_4$, also on solid slabs of the 2 latter. The material makes little difference, the cond. depending almost wholly on the d. A study was made of 31 samples of scale collected at random. The $CaSO_4$ scale had always a high d., the SiO_2 always a low d., while the $CaCO_3$ was usually dense. A SiO_2 layer 0.02 cm. thick may do as much harm as a dense $CaSO_4$ layer 0.4 cm. thick. Photomicrographs of the scale, and a discussion of the possible modes of formation, are given. ERNEST W. THIELE

Fractured boiler plates. GEORGE NESS AND DOUGLAS A. MACCALLUM. *J. West. Scot. Iron and Steel Inst.* **35,** 101–9(1928).—Several cases are given of fractured boiler plates and straps, along with analyses of steel, phys. properties and analyses of scales occurring between straps and plates. Analyses of feed water and boiler water after 43 days, steaming are given. It is concluded that the origin of fractures can be traced to purely mech. causes, and that caustic embrittlement is not a necessary cause of failure. Numerous *photomicrographs of steels* are given. J. K. ROBERTS

Boiler-corrosion problems. F. N. SPELLER. *Fuels and Steam Power, Am. Soc. Mech. Eng. Trans.* **50,** 222–3(1928).—Problems for investigation are: corrosion rate and H_2 evolution in the absence of dissolved O_2 through range of acidity and alky. in general practice and 140 to 450° F.; the same with dissolved O_2 present within practical ranges; detn. of dissolved O_2 in operating boilers at different points in the boiler; detn. of H-ion concn., alky. or acidity at boiler temps. *vs.* 68° F., and effect of dissolved salts on the same; formation of protective films on heating surfaces and relation to dissolved O_2, alky., acidity, chlorides; pitting under scale; electrolytic prevention; corrosion from org. materials; action of inhibitors at boiler temps. E. M. SYMMES

Tuberculation of cast-iron pipe. CHARLES W. SHERMAN. *J. New Eng. Water Works Assoc.* **42,** 259–77(1928).—A reprint of a discussion which appeared in 1852–3. The tubercle is supposed to be a concn. of rust from the entire corroded area. Two other later examples are recorded. D. K. FRENCH

Engineering methods economically combat stream pollution (treatment of acid waste from brass cleaning). W. L. SULLIVAN. *Chem. Met. Eng.* **35,** 483–5(1928).—*Acid waste* from brass cleaning contg. HNO_3 and H_2SO_4 equiv. to 0.3% H_2SO_4 by vol. may be treated by allowing it to react with Fe shavings but is objectionable in color.

Treatment with limestone as adopted gives a clear colorless effluent which is not acid to methyl orange. 50,000–80,000 gal. per day flows through 3 wooden tanks of 0.75–1.0 in. dolomitic limestone and a fourth containing 0.25–0.5 in. high-grade limestone. Flow is downward through the first 2 tanks to permit skimming of Ca soap and upward through the last 2. Diln. to 0.3% H_2SO_4 is provided. To prevent coating the limestone, soapy water is diverted to a sanitary sewer. Crystn. of $CaSO_4$ is prevented by draining each night, use of dolomitic limestone and diln. Water is run for 2 hrs. after plant operation ceases. The stone is then flushed and sludge run to sedimentation basins. FOSTER DEE SNELL

Efficiency of a tannery-waste-treatment works. T. C. SCHAETZLE AND A. W. BLOHM. *Bull. Md. State Dept. Health* **1**, 73–84(1928); *U. S. Pub. Health Eng. Abs.* **E-637b**, 55(1928).—Wastes are screened through a Dorrco screen with 1–8 in. slotted plate and then pass through a Dorr thickener. From here they pass through a dry run to a tidal basin. Part of the sludge is dried on a bed and the remainder lagooned. The tank has a detention period varying from 0.59 to 2.16 days. Av. results of analysis show a reduction of suspended solids of 44% and O consumed 26%. The effluent has a high color, is turbid, and is still high in B. O. D. Tables showing results of analyses are included. Expts. were conducted to det. the effect of coagulants—lime, alum and iron were the most promising. Darco and Norit filters gave some promise. No data as to amt. of coagulants are included. Conclusions state that the screen and clarifier are functioning as well as could be expected, but the effluent was still highly colored, very turbid, contained much suspended matter, and had high O-consumed and B. O. D. values. C. R. FELLERS

Identification of oil-field waters by chemical analysis. C. E. REISTLE, JR. *Chem. News* **137**, 101–2(1928); cf. *C. A.* **21**, 2518.—Chem. analysis, when performed for that purpose, may assist greatly in identifying H_2O from different strata in oil fields. G. CALINGAERT

Condenser leakage. Its detection and effect on boiler-water concentration. W. C. CARMICHAEL. *Power* **68**, 267–70(1928).—Directions are given for detn. of alkali and chloride. D. B. DILL

Application of hydrogen-ion control to water and sewage work. W. A. TAYLOR. La Motte Chem. Co., Balt. *Proc. 10th Texas Water Works Short School* Jan. **1928**, 117–34; *Pub. Health Repts.* **43**, 2226–7(1928).—The application of p_H control to water purification, particularly in the matter of securing the optimum p_H for the most economical coagulation of public water supplies, is treated. With the use of alum it was found that the optimum for the majority of waters lies between p_H 5.5 and 7.0, varying with the character of water to be treated. That the proper p_H control is of great value in correction of "red water," and other problems due to corrosive action, is brought out, as well as its applicability to water-softening processes and with particular reference to boiler feed water, cooling water for condensers, and refrigerating brines. With relation to sewage-disposal work, the investigations conducted by Rudolfs, of New Jersey, are made the basis of applicability of p_H control to the most efficient sludge-digestion methods, whether in Imhoff, septic, or sep. sludge-digestion tanks. Rudolfs finds the optimum for sludge digestion is p_H 7.3 to 7.6. At Milwaukee it has been found that activated sludge can be freed from water most effectively when the p_H value is brought down to about 3.4 by the addn. of acid. The application of p_H control to the problem of industrial-waste treatment is discussed. In the treatment of various textile wastes, the most efficient purification takes place at p_H values from 6.0 to 9.0, particularly if $FeSO_4$ is used as coagulant, the most general value being 8.0 to 8.2 for copperas and 7.2 for alum. C. R. FELLERS

Sewage treatment in the light of European practice. GEORGE B. GASCOIGNE. *Eng. News-Record* **101**, 91–6(1928).—A discussion of European practice in sewage treatment based upon observations made during visits to 25 municipal sewage works in England and Germany. Chlorination is employed only in cases of emergency. Local farmers, as a rule, recognize the value of dried sludge as a fertilizer, and will take all that can be obtained. Practically all the works are experiencing difficulties because of oil, but no satisfactory soln. has been found for this problem. Progress in the development of the activated sludge process is substantial. The presettling of sewage prior to activation, and the digestion of the excess activated sludge with the primary sludge have made the process attractive for a variety of conditions. The best method of aeration is still to be detd. The practice of collecting and utilizing the gas produced during sludge digestion is increasing. At present the disposal of phenolic wastes is best accomplished by their inclusion and treatment with domestic sewage. Means for certain elimination of these wastes from drinking water is being

sought in the development of a suitable absorptive for use in connection with the regular purification processes. R. E. THOMPSON

Degasification of Imhoff tanks at Cleburne, Tex. CHESTER COHEN. *Eng. News-Record* **101,** 319-20(1928).—The sewage-treatment plant of Cleburne consists of a double Imhoff tank unit, dosing chamber, sprinkling filter and sedimentation tank. The Imhoff tank settling capacity is 5.4 hrs. and the sludge-digestion capacity is equiv. to approx. $^1/_2$ cu. ft. per capita. Septic sewage of high H_2S content, aggravated by the relative inadequacy of digestion capacity, leads to serious gassing and foaming and odor nuisance. A pump was designed, activated by the changing levels in the dosing chamber, to create a suction on the Imhoff tank gas vents. One-such unit maintains a vacuum of 6 in. of water and 2 units approx. 12 in. The gas drawn from the tank is of sufficient vol. to drive a $4^1/_2$-h. p. gas engine. The operation of the tanks has been improved to such an extent by the degasification that whereas the plant was previously considered to be overloaded, it has now been found possible to be operated with one of the tanks out of service. Foaming has been eliminated and odors have been reduced to a remarkable extent. The digestion of the sludge is also hastened. The final effluent has a stability of over 98%, a biochem. O demand of 15 p. p. m., and a turbidity of not more than 12 p. p. m. R. E. THOMPSON

Converting garbage into fertilizer. Municipal plant at Bilbao. D. RAMON ARRARTE. *Quim ind.* **5,** 123-5(1928).—After a study of the systems employed in European capitals the "Lightning" system of the Patent Lightning Crusher Co., Ltd. was adopted. A detailed description is given. MARY JACOBSEN

Yorkshire rivers purification—wool manufacturer's problem (BARKER) **25.** The best material for water pipes in buildings (BÖRNER) **1.** Corrosion in steam heating system (SPELLER) **9.** The activity of Fe and its practical importance (KÖTSCHAU, SIMON) **11H.** Sulfur waters of Helouan-des-Bains (NARKIRIER) **11H.** Automatic colorimeter (BAGANZ) **1.** *Euglena* in relation to combined N (PETERSON) **11C.** Method of evaluation of analyses (LIESCHE) **7.** Filter for water (U. S. pat. 1,684,025) **1.**

ELLMS, JOSEPH W.: **Water Purification.** 2nd ed., enlarged. New York: McGraw-Hill Book Co., Inc. 594 pp. $7. Reviewed in *Am. J. Public Health* **18,** 1201; *Eng. News-Record* **101,** 106(1928).

Clarification and purification of waste waters and other liquids. ANDREAS RAVNESTAD. Norw. 40,417, May 30, 1927. The content of suspended particles is removed by treating the liquid with org. colloids, especially from marine plants, which have been coagulated before or after being added to the liquid. Besides these colloids a suspension of solid, liquid or gaseous substances is also added before, during or after the coagulation of the colloids, the added suspension having the property of settling quickly either as a ppt. at the bottom or as a foam layer at the top of the liquid. The added substances are chosen in such a way that the elec. charge of the added particles is opposite to that of the original particles, in order to produce a reciprocal discharging of the particles. Cf. *C. A.* **21,** 1320.

Water softening. OTTO LIEBKNECHT (to The Permutit Co.) Can. 282,517, Aug. 14, 1928. A base-exhange compn. is manufd. by treating a material contg. a hydrated sesquioxide with an aq soln. of an alkali metal silicate under superatmospheric pressure.

Preventing incrustation in boilers. W. LAZARUS. Brit. 283,517, Jan. 12, 1927. The use of soot and soda as described in Brit. 271,337 (*C. A.* **22,** 1642) is modified by the use of a larger quantity of soot, charcoal or plumbago in finely divided form, and of an alkali or alk. carbonate adapted to the total hardness of the water. Alkali or alk. carbonate is subsequently added daily.

Boiler compound. AKTIESELSKAPET NORSK KJELERENSNINGSMIDDEL. Norw. 42,895, June 27, 1927. The following compn. is added to the water: 25-35 parts of caustic soda, 7-10 Na_2CO_3, 0.8-1.2 quebracho and 80-130 H_2O.

Increasing the efficiency of zeolites for treating water. WOLCOTT C. FOSTER and ARTHUR S. GARRETT. U. S. 1,683,967, Sept. 11. Raw water with a low initial alky. is treated with NaOH or Na_2CO_3 or other suitable salt which is alk. in soln. until a predetd. standard of alky. is reached and the water is then filtered through zeolite material.

Apparatus for [illegible] **water by treatment with iron scale or other deoxidizing material and filte**[illegible] CHRISTIAN HÜLSMEYER. U. S. 1,683,780, Sept. 11. The water may also be [illegible] to magnetic sepn. or elec. treatment.

Base-exchanging substances. ARTHUR ROSENHEIM. (Otto Liebknecht, inventor.) Ger. 463,719, July 19, 1928, addn. to 462,147. Base-exchanging substances are obtained by glassifying leucite, feldspar, nepheline, orthoclase, plagioclase, adularia, microcline, sodalite, noselite, hauynite, lazurite, analcite, natrolite, chabazite, harmotone, phillipsite, staurolite, desmine, apophyllite or ordinary glass with materials contg. the components required for base-exchanging power, *e. g.*, alkali carbonates, sulfates, lime, water glass, etc. Cf. *C. A.* **22**, 2803.

Glauconite. ARTHUR ROSENHEIM. (Otto Liebknecht, inventor.) Ger. 463,841, July 19, 1928. The base-exchanging properties of glauconite or materials contg. it are increased by heating it with solns. of salts, especially of the alkalies and ammonia at temp. above 70°. Pressure can be used. The salts mentioned are the carbonates, silicates, phosphates, borates, chlorides, nitrates and acetates of the alkalies and ammonia. The hydroxides also may be used.

15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

Justus Liebig as the founder of agricultural chemistry. F. HONCAMP. *Z. angew. Chem.* **41**, 463-7(1928). E. H.

Reclamation of the Fresno type black-alkali soil. W. P. KELLEY AND E. E. THOMAS. Calif. Agr. Expt. Sta., *Bull.* **455**, 1-37(1928).—Field expts. showed that the crop-producing power of the Fresno black-alkali soil can be greatly improved by the use of gypsum, S, $Fe_2(SO_4)_3$ or alum, provided these materials are applied in sufficient amts. Yields of alfalfa ranging from 6 to 11 tons per acre per annum have been produced on land which at the beginning of the expts. was entirely unproductive. The unproductivity of this soil is due to (1) an excess of sol. salts, especially Na_2CO_3, and (2) the abnormal chem compn. of the clay-like constituents of the soil. The reclamation of the soil must involve the removal of the excess of sol. salts and the conversion of at least a part of the clay constituents into Ca compds. The former may be leached out, but ordinary leaching fails to bring about the needed chem. changes in the latter. Gypsum, S, $Fe_2(SO_4)_3$, and alum produce beneficial effects on black-alkali soils but at different rates. These materials act on the sol. carbonate and the clay constituents simultaneously. Gypsum brings about these changes because of its sol. Ca, while the effect of S, $Fe_2(SO_4)_3$, and alum is due to their acidic nature, in consequence of which sol. carbonate is decompd. and Ca minerals of the soil, especially $CaCO_3$, are dissolved. The Ca thus brought into soln. reacts with the clay constituents. $Fe_2(SO_4)_3$ and alum react with the soil most quickly because of their high soly. and acidic nature. S. acts most slowly for the reason that this material must undergo oxidation before it can produce any important effect on the soil. Gypsum produced uniformly successful results on this soil only when applied at the rate of more than 10 tons per acre. Relatively large amts. of $Fe_2(SO_4)_3$ and alum are also required. On the other hand, excellent results have been obtained by applying not more than 1 ton of S per acre. S has proven to be much more economical than the other aterials. Large yields of alfalfa have been produced on soil that was badly affected with alkali and entirely unproductive at the outset by applying 1 ton of S per acre; when used in conjunction with stable manure, 1000 lb. of S per acre has given good results. Although the beneficial effect of S is dependent on oxidation, and the oxidation is brought about by certain species of bacteria, these expts have not shown any special advantage for artificially uninoculated S over that obtained from uninoculated S. Active forms of one or more of the species of S-oxidizing bacteria occur naturally in this soil and nothing appears to be gained by special inoculation of the S. Unless the soil is well drained there is no reasonable prospect of permanently reclaiming any alkali soil. Under the soil and climatic conditions that prevail in the Fresno section, the water table should never be less than 6 feet below the surface, and preferably deeper. C. R. FELLERS

A map of the agricultural soils of Italy. GIOACCHINO DE ANGELIS D'OSSAT. Univ. Perugia. *Ernähr. Pflanze* **24**, 332-5(1928).—Reproduction of map, scale 1:2,000,000, with discussion. LAWRENCE P. MILLER

The (nitrogen)-fixing power of soils. S. WINOGRADSKY. *Chimie et industrie* Special No., 91-100(April, 1928).—An address outlining the development of methods of investigation of soil microbiology, describing at length the so-called direct method devised by W. (*C. A.* **20**, 2382, 2889; **21**, 976), and discussing the possible application of the method in agronomy. A. PAPINEAU-COUTURE

Calculation of soil respiration. H. Lundegårdh. *Biochem. Z.* **194**, 453(1928).—A misprint in L.'s formula ("Kreislauf der Kohlensäure in der Natur," *Jena*, **1924**, 146; cf. *C. A.* **18**, 2023) for detg. the production of CO_2 by soils is corrected, the formula becoming: $[(a - b) \times 1.858 \times V \times 60/t]/10Y$ g. of CO_2 per hr. per sq. m. of surface, where a is the original and b the final percentage value of the CO_2 content of the bell-jar, t is the time in min., 1.858 the wt. of 1 l. of CO_2 at 15° and 760 mm., V the vol. of the bell-jar in cc., and Y the surface in sq. cm. covered by the bell-jar. B. C. A.

The absorption of rain water during vegetation by the soil and its utilization by plants. N. Tulaikov and A. Kozhevnikov. *Soil Sci.* **25**, 213–24(1928).—Intensive utilization of the water resources of the soil by winter rye begins from the moment of its spring awakening. The expenditure of water by the winter rye began with the surface layers of the soil, and the accessible resources throughout a depth of 50 cm. were utilized during the dry period from May 13 to June 5, during which time 65% of the dry matter of the crop was produced. The lowering of the moisture content observed under spring wheat in May must be attributed to the surface evapn. of water. The period of utilization of moisture resources under spring wheat has been shifted 2 weeks when compared with the winter rye. During the 11 days of rapid growth the moisture content of the 50 cm. layer of the soil fell to the so-called "dead resources." After harvesting the winter rye and the spring wheat, the soil, to a depth of 100 cm., was dry to the point of its so-called "dead resources of moisture." The course of the moisture content of the soil under sunflower during the first part of its vegetation period was similar to that of the plot on the fallow. A lowering of the moisture content was noticed only from June 24 to 30 during the intensive development of the sunflower. A still greater expenditure of water was noticed in July when the greatest portion of the dry matter was produced. The soil under fallow lost its water during the spring in the same way as the soils under spring wheat and sunflower. It reached a limit of 18%. The rain during the summer did not increase the moisture content of the soil under fallow. E. F. Snyder

The measurement and interpretation of the water-supplying power of the soil with special reference to lawn grasses and some other plants. J. Dean Wilson. Johns Hopkins Univ. *Plant Physiology* **2**, 385–440(1927).—The main soil condition controlling the general vigor and color of both level and sloping lawns at Baltimore is the water-supplying power of the soil. Soil-point detns. (*C. A.* **14**, 3697) at a depth of 6 cm. should give very useful information in detg. and outlining the best irrigation practice for lawns in humid or semi-humid, temperate regions. Walter Thomas

The Gehring-Wehrmann method for the determination of the lime saturation degree of soils. A. Gehring. *Ernähr. Pflanze* **24**, 206–9(1928).—Cf. *C. A.* **22**, 294. Lawrence P. Miller

The acidity of soil for sugar cane. O. Arrhenius. *Arch. Suikerind.* **36**, 511–6 (1928); cf. *C. A.* **22**, 475.—To eliminate the influence of the phys. structure of the soil in making expts. on soil reaction, a new series of expts. was made with garden soil at the reactions p_H 4.5, 6, 7, 8, and 8.5. The variety used was 2878 POJ, the growing period 5 months. The results are given in a graph. Above p_H 7, the garden soil gave higher yields than the clay, probably because it is less affected by the addition of alkali. The results again show that a neutral reaction gives the highest yield and that the quality of the cane is probably more affected than the quantity. The Al question is of importance only on acid soils, with a p_H below 4.5, and therefore is of little or no interest for Java. Three hundred soil samples from Bandjaratma plantation were tested for Al with Goppelsröder's reagent, which is sensitive to 1 part per million. Not 1 of the 300 samples had Al. Only the most acid soils, and probably the most alk. soils could contain too much Al, but such soils are not suitable for cane cultures anyway. To change the reaction of the soil, various chemicals may be used, such as lime, press cake, marl, clay, S, H_2SO_4, etc. To det. the amt. of lime to be used, it is best to titrate with a mixt. of equiv. quantities of $Ca(OH)_2$ and $Ca(HCO_3)_2$. For North German and Swedish soils a relation between the buffer action and the hygroscopicity was found, but such a relation does not exist in Java soils. P. R. P.

Determination of carbon dioxide in carbonates in soil. A. Riad. *Analyst* **53**, 486–7(1928).—Suggestions are made to obviate the formation of $BaCO_3$ from the action of air when Hepburn's modification of the Van Slyke method is used. W. T. H.

The numbers of microörganisms in Carrington loam as influenced by different soil treatments. Lewis W. Erdman. *Iowa State Coll. Agr. Res. Bull.* **109**, 233–58(1928).—The highest nos. of bacteria were found in the soils in Mar. of 1926 and July and Nov. in 1925. Great fluctuations in nos. of bacteria occurred from one sampling to another.

The greatest no. of fungi was found in the soils in Nov., 1924, gradually decreasing during the winter months and reaching a min. in June, 1925. Another max. was reached in Jan., 1926. This increase was followed by a decrease in nos. which reached a low point in Apr. From then on great fluctuations occurred which cannot be explained from the data obtained. The nos. of actinomycetes varied with the no. of bacteria. An increase in bacteria was followed by an increase in nos. of actinomycetes. The relative proportion of these 2 groups of organisms was between 1 to 10 and 1 to 20. No correlation existed between the nos. of microörganisms and the NO_3 accumulation in the soils. The amt. of moisture varied in the soils at the different samplings, but this factor did not have any appreciable influence on the nos. of microörganisms. The nos. of fungi in this soil were not affected by application of manure alone, or of manure and lime. Superphosphate and rock phosphate, when added with lime and manure, caused a slight increase in the nos. of fungi present. The nos. of bacteria in this soil were increased by all of the soil treatments studied. Manure and lime increase the no. more than did the manure alone; manure, lime and rock phosphate increased the no. more than did the manure and lime; and manure, lime and superphosphate brought about the greatest increase in nos. of bacteria. The various soil treatments did not seem to affect the no. of actinomycetes in this soil. All of the soil treatments increased the crop yields. There was a direct correlation between the no. of bacteria in the different plots and crop yields. Where superphosphate or rock phosphate was used a correlation was noted between nos. of fungi and actinomycetes and crop yields.
E. F. Snyder

Comparative tests of methods of making counts of soil microörganisms. Georg Kühlmorgen-Hille. Univ. Leipzig. *Centr. Bakt. Parasitenk.* 2 *Abt.* **74**, 497–519 (1928).—A detailed study of the effect of variations in culture media. J. T. M.

The decomposition of sodium cyanide. Alfred Aslander. Cornell Univ. *Bot. Gaz.* **85**, 462–3(1928).—NaCN decomposes rapidly in the soil but not in 0.1 *N* soln. having a reaction of p_H 11.75. This indicates that decompn. is brought about by microörganisms. Benjamin Harrow

Fertilization with potash salts and soil reaction. H. Kappen. Landw. Hochsch. Bonn, Poppelsdorf. *Ernähr. Pflanze* **24**, 281–92(1928).—An address. L. P. M.

Intensive fertilization on a rational basis. H. Neubauer. Landw. Vers., Dresden. *Ernähr. Pflanze* **24**, 273–81(1928).—On the basis of the results from the method of N. (cf. *C. A.* **18**, 877) for the detn. of available K and P in a soil, it is possible to det. quite accurately the amt. of these elements to be added to the soil. Pot culture expts. cannot be used for the exact detn. of available N; the amt. of N to be added must be based, therefore, on a knowledge of response to N application of the soil in question together with a consideration of the amt. of N used by the particular crop to be grown.
Lawrence P. Miller

The success of the use of nitrogen fertilizers in prairies and postures in Holland. Charles E. H. Boissevain. *Chimie et industrie* Special No., 121–7(April, 1928).—An address describing the increased yields and improved compn. of grass, resulting in higher milk yields, obtained in Holland by the use of N fertilizers. A. P.-C.

The toxicity to cotton seedlings of high concentrations of soluble nitrogenous fertilizers. L. G. Willis and E. A. Davis. N. Car. Agr. Expt. Sta., *Tech. Bull.* **30**, 1–12(1928).—Field expts. indicate that heavy applications of nitrogenous fertilizers are necessary for the economic production of cotton and the N should be added early in the growth of the plants for best results. The sol. forms of N are injurious when drilled in close contact to the seed. Nitrogenous compds. not fixed by the soil, even though properly distributed, may be brought to the surface by the rise of capillary moisture and reach a degree of concn. such as seriously to injure the plants. In pot expts., the concn. of N necessary to cause injury is about the same whether this element is supplied as $NaNO_3$, $(NH_4)_2SO_4$, $Ca(NO_3)_2$ or Leunasaltpeter. Heavy applications of urea were more toxic than other forms carrying the same amt. of N. The osmotic pressure of the soil soln. increased with increased rates of application of all compds. used, being least with urea and greatest with nitrates. There was no correlation between fertilizer injury and osmotic pressure of the soil soln. Absorption of N was rapid during the first 4 days of growth, NH_3 compds. being better absorbed than nitrates. The amt. of N absorbed from each compd. was increased with increases in the rate of application. Absorption was greatest when urea was used. The greater toxicity of this substance in pot expts. may result from free NH_3 formed from the decompn. in contact with the soil, a condition which might never occur in field practice.
C. R. Fellers

The biology of stable manure conservation. Br. Niklewski. Univ. Poznan.

Centr. Bakt. Parasitenk. 2 *Abt.* **75**, 206–13(1928).—Straw depresses plant growth as measured by the development of yeast cells. N in the form of $(NH_4)_2SO_4$ can overcome the inhibiting effect. Manure inoculated with nitrite bacteria loses less N than do uninoculated controls, the content of NH_3 and amino N being higher. Inoculated manure has a smaller quantity of colloidal material. JOHN T. MYERS

Comparative biological and chemical studies on different kinds of stable manure. IV. Varieties of horse manure. G. RUSCHMANN. Inst. Garungsgewebe, Berlin. *Centr. Bakt. Parasitenk.* 2 *Abt.* **75**, 182–205(1928); cf. *C. A.* **22**, 1646.—Five samples of horse manure varying in age from 1 week to 6 months were studied as to nitrite and nitrate content, and activity in nitrification and denitrification. If there has been much oxidation of NH_3 in manure its denitrifying power is weak; hence nitrites and nitrates accumulate. Those manures which denitrify actively are weak in nitrifying power. Fermentation of manure at high temps. is more important than at low temps. In thick masses, O is soon used up and nitrification stops. The balance between nitrification and denitrification is very delicate. JOHN T. MYERS

Application of activated charcoal as fertilizer for grains. S. HOLYNSKI. Inst. Agr. Pulawy, Poland. *Przemysl Chem.* **12**, 190–6(1928).—Activated charcoal furnished by the Military Gas Inst. (Warsaw) increases the crop and its content of P and N. It deserves detailed field investigation as a possible aid in fertilizing, especially in sandy soils and sands This charcoal probably regulates the consumption of fertilizers by plants. When applied in large quantities it may alter the phys. properties of the soils, *e. g.*, by changing their water capacity. When added to lime-nitrate it causes changes in that fertilizer which may mitigate the disastrous results of formation of dicyanodiamide. Its addn. to superphosphate does not increase even though it does not prevent the retrogradation of phosphoric acid. A. C. Z.

Fumigation of vineries with calcium cyanide. J. C. WOODFIN. New Zealand Dept. Agr. *New Zealand J. Agr.* **36**, 192–3(1928).—$Ca(CN)_2$ was extremely efficient as a destructor of vermin and insect pests. To avoid leaf burning, from $^1/_3$ to $^3/_4$ oz. $Ca(CN)_2$ used per 100 cu. ft. was found effective. After picking the grapes, 4 oz. per 100 cu. ft. should be used to control mealy bugs. C. R. FELLERS

Preliminary tests of ozone as an insecticide. E. N. CORY AND H. B. MCDONNELL. Univ. Maryland. *J. Econ. Entomol.* **21**, 510(1928).—At 4 mg. per l. in air, and 25 sec. to 5 min. exposure, ozone was lethal to 4 species of insects. Its action upon the larvae of 2 species could not be correctly interpreted. The adaptability of ozone to the control of stored product insects will be investigated. C. H. RICHARDSON

Notes on oil emulsions with special reference to Aphis on apple. S. W. FROST. *J. Econ. Entomol.* **21**, 504–6(1928).—Lab. and field tests with petroleum oils (kerosene and six other heavier oils of paraffin and asphaltum base) emulsified in the cold with Ca caseinate showed that a high % of rosy aphis (*Anuraphis roseus*) may be killed when a drenching spray is used. Light applications of the same emulsions gave poorer results. The oil concns. used were generally 3% by vol. In the lab. light applications gave only partial control of red spider. Apple trees, 2–12 years old, were not injured by 1.5 and 3% sprays of kerosene and red engine oil even when applied as late as June. C. H. RICHARDSON

Petroleum oil as a carrier for nicotine. E. R. DE ONG. Calif. Agr. Expt. Sta. *J. Econ. Entomol.* **21**, 502–4(1928); cf. *C. A.* **22**, 3482.—The value of petroleum oil as a spray is not confined alone to its insecticidal properties; it is potentially useful as a carrier for more active insect poisons or for fungicides. Kerosene and 3 highly refined petroleum oils (viscosity, Saybolt, 55–60, 70–80 and 106 secs., resp.) were tested as insecticides with and without the addn. of nicotine (0.01 and 0.02%) for the brown apricot scale (*Lecanium corni*). The oil-nicotine mixts. were more effective than the oils alone. It was also found that kerosene-nicotine was nearly as efficient as the heavier oils mixed with nicotine with advantages to the former in favor of cost and danger to plant tissue. Oil-nicotine mixts. are promising for use on trees in foliage. They probably will not offer advantages over other oil prepns. for dormant spraying. C. H. RICHARDSON

Naphthalene control of red spider and other insects on miscellaneous crops in the U. S. Department of Agriculture greenhouses. G. M. DARROW. *J. Econ. Entomol.* **21**, 511(1928); cf. Hartzell, *C. A.* **21**, 792.—The vaporization of 1.5–3 and 4.5 oz. naphthalene per 1000 cu. ft. of greenhouse space killed eggs and adults of the red spider, adult white flies, ants and aphids without injuring strawberries, cotton plants, cucumbers, chestnut, carnation, primrose, croton, lilies and other plants. Only a few varieties were injured by the 4.5-oz. dosage. The compd. is vaporized by a lamp. C. H. RICHARDSON

Spray recommendations for codling moth control, Washington, for 1928. E. C. JOHNSON, *et al.* Wash. State Agr. Expt. Sta., Wash. State Dept. Agr. and Federal Bureau Entomology. *J. Econ. Entomol.* **21,** 512-4(1928).—The following recommendations are made concerning the use of insecticides: $PbHAsO_4$, 1 lb. in 50 gal. water, is the only efficient insecticide to use. A mixt. of petroleum oil and $PbHAsO_4$ is effective but may injure fruit and foliage. Petroleum oil alone is not as effective as the oil and arsenical mixed. Nicotine sulfate and other insecticides are either ineffective or in the exptl. stage. Sprays should be applied to control the first brood. The no. of subsequent sprays will vary with locality and must be detd. by the grower. Thoroughness of spraying is stressed and supplementary treatments (traps, bands, orchard sanitation) are discussed. Other biol. information is given. C. H. R.

The use of arsenicals in French vineyards. L. O. HOWARD. Bureau of Entomology. *J. Econ. Entomol.* **21,** 510(1928).—The employment of arsenicals is now permitted in vineyards between date of vintage and the time when grapes begin to darken the next season. C. H. RICHARDSON

The control of the beemoth. F. B. PADDOCK. Iowa State Coll. *J. Econ. Entomol.* **21,** 489-94(1928).—SO_2, CS_2, CCl_4, HCN, *p*-dichlorobenzene, HCHO, $Ca(CN)_2$, a mixt. of CCl_4 and Et acetate and several proprietary substances are discussed as fumigants for the beemoth (*Galleria mellonella*). Conclusion: Very little is known about control measures for this insect and extensive investigations are needed. Hive sanitation, parasitic control and repellants have thus far not been successful. High and low temps. are possible control measures. C. H. RICHARDSON

Experiences and observations in the campaign against hedge mustard. J. WEIGERT AND F. FURST. Landesanstalt f. Pflanzenbau, Munchen *Ernahr. Pflanze* **24,** 110-4, 139(1928).—Broadcasting of finely ground kainite, cyanamide and mixts. of the two and spraying with solns. of Fe vitriol, "Raphanit," and kainite were tested over several years for their effect against hedge mustard. Weather conditions at the time of application greatly influenced the results. On the whole, finely ground kainite and "Raphanit" solns. gave the best results LAWRENCE P. MILLER

The relation of flies and fly sprays to milk production. S. B. FREEBORN, W. M. REGAN AND A. H. FOLGER. Calif. Agr. Expt. Sta. *J. Econ. Entomol.* **21,** 494-501 (1928).—In an attempt to ascertain the loss in milk production in cows which have been sprayed with fly sprays it was found that (1) exposing cows to a very heavy infestation of house flies (*Musca domestica*) did not lower milk production; (2) that in the absence of flies, sponging the cows with water had no effect on milk production; (3) spraying the cows with water caused a 5.4% loss in production; (4) spraying with pine tar-creosote mixt. caused a 6.9% loss; (5) spraying with a white petroleum oil (viscosity 68 Saybolt) caused a 9.7% loss. During the last 2 weeks of spraying a 12.5% loss attended the use of the pine tar-creosote mixt. and a 22.8% loss resulted from the use of the white petroleum oil. The body temp. of the oil-sprayed cows was consistently higher and the respiration rate 40% av. higher than normal (cf. *C. A.* **20,** 2555). C. H. RICHARDSON

Constitution of aluminosilicates, conditions of their formation and transformation in soil (WAHL) **6.** Converting garbage into fertilizer—municipal plant at Bilbao (ARRARTE) **14.** Industrial treatment of phosphorites [for fertilizer] (VOLFKOVICH, KAMZOLKIN) **18.** H-ion studies of water, peat and soil, in relation to ecological problems at Bacon's Swamp, Indiana (CAIN) **11D.** The causes of the plastic conditions of clay (SALMANG) **19.** Treating hygroscopic salts (Norw. pat. 44,289) **18.**

Phosphates. F. G. LILJENROTH. Brit. 283,187, Jan. 8, 1927. Raw Ca phosphate material is treated with acid to recover H_3PO_4 and Ca is sepd. by pptn. as $CaSO_4$ which is treated with NH_3 and CO_2 to form $(NH_4)_2SO_4$ and $CaCO_3$. The $(NH_4)_2SO_4$ soln. may be used to ppt. addnl. $CaSO_4$ and finally may be neutralized with NH_3 and concd. to obtain a *fertilizer*.

Fertilizers. F. G. LILJENROTH. Brit. 283,908, Jan. 20, 1927. In treating crude Ca phosphate with acid and sol. sulfate as described in Brit. 282,330 (*C. A.* **22,** 3727 less leaching acid is used than corresponds with the lime in the phosphate.

Fertilizers and magnesium salts. F. G. LILJENROTH. Brit. 283,558, Jan. 15, 1927. Material contg. a sol. Mg salt such as $MgSO_4$ or $MgCl_2$ is dissolved in water and treated with NH_3 and CO_2 to ppt. the Mg as carbonate and form an NH_4 salt in soln. Excess CO_2 and a greater excess of NH_3 are added and are recovered from the ppt. by heating or washing with hot water and from the soln. by heating. HNO_3 is added to the ppt. and further CO_2 thereby recovered. The treatment is suitable for application to

materials such as kieserite, kainite or potash contg. Mg as an impurity. Products may be obtained which are suitable for use as fertilizers. The initial material contg. Mg may be freed from HCl by heating it with H_2SO_4. Raw Ca phosphate may be leached with HNO_3 mixed with $(NH_4)_2SO_4$ soln. obtained in the process, $CaSO_4$ formed filtered off, and the remaining soln. evapd., after neutralizing with NH_3, to form a fertilizer.

Fertilizer containing calcium nitrate and potassium nitrate. NORSK HYDRO-ELEKTRISK KVAELSTOFAKTIESELSKAB. Norw. 44,668, Dec. 5, 1927. By mixing $Ca(NO_3)_2$ (Norway saltpeter) with 5–25% of KNO_3 a mixt. is obtained which has a higher m. p. and which solidifies more rapidly after being melted than is the case with unmixed lime saltpeter.

Fertilizer containing potash and nitrogen. NORSK HYDRO-ELEKTRISK KVAELSTOFAKTIESELSKAB. Norw. 45,058, April 16, 1928. A supplement to Norw. 28,373. NH_4NO_3 is dried and granulated under addn. of less hygroscopic salts, for instance KCl. The K salt is eventually applied in amts. sufficient for making the resulting product a mixed fertilizer in which the K_2O content has a full com. value.

Treating ammonium nitrate. NORSK HYDRO-ELEKTRISK KVAELSTOFAKTIESELSKAB. Norw. 44,288, Aug. 8, 1927. The invention intends to produce an NH_4NO_3 fertilizer which can be stored in granular condition without clogging to hard lumps. NH_4NO_3 and $Ca(NO_3)_2$ are melted together to a homogeneous mass, which is then granulated. Or the salts may be mixed in soln., the soln. evapd. and the residue crushed. NH_4NO_3 also may be treated with a mixt. of $Ca(NO_3)_2$ and a sulfate, preferably $(NH_4)_2SO_4$. A suitable proportion is 10% of $Ca(NO_3)_2$ or thereabouts.

Treating ammonium nitrate and similar substances for fertilizers. NORSK HYDRO-ELEKTRISK KVAELSTOFAKTIESELSKAB. Norw. 44,691, Dec. 27, 1927. The intention of the treatment is to produce good keeping and easily spreadable fertilizers from NH_4NO_3, etc. The salt in question is treated with H_3PO_4 and afterwards with NH_3 in order to form a surface coating of NH_4 phosphate on the salt particles. Eventually so much of H_3PO_4 and NH_3 may be applied that the resulting product becomes a mixed fertilizer in which the content of P_2O_5 has a full com. value. The process is carried out under const. stirring, in one single or in 2 sep. app. Eventually the treatment may be carried out in several steps in order to avoid any considerable liberation of the original acid. In the case of NH_4NO_3 a fog of NH_4NO_3 is formed during the neutralization. This fog is removed from the app. by passing the NH_3 gas through the app. in const. circulation during which the salt fog is removed outside the neutralizing app.

Granular non-dusting calcium nitrate. NORSK HYDRO-ELEKTRISK KVAELSTOFAKTIESELSKAP. Norw. 44,149, June 27, 1927. Crushed dust-contg. $Ca(NO_3)_2$ is heated, eventually under addn. of some moisture, under const. motion in a rotary drum. The heating may be wholly replaced by the application of moisture. The crushed salt may first be passed through a classifier where the particles below a certain limit of size are sepd. and subjected to the above treatment.

16—THE FERMENTATION INDUSTRIES

C. N. FREY

Report on the sixth season's work at the experimental oast. A. H. BURGESS. *J. Inst. Brewing* **34**, 248–64(1928).—A summary is given of results of sixty kiln loads of hops dried under varying conditions. Hops dried at 8 diff. temps. between room temp. and 100° showed the same resin content. A decrease in a resin occurred in the hops dried at above 80°. Tests with sulfuring showed that SO_2 gave a slightly better colored hop than when S was burned. About 3% of the S used was retained by the hops and appeared to increase the value found for a resin, probably because of the formation of $PbSO_4$ in the method used for detg. a resin (in which the resin is pptd. as Pb salt). Measurement of the dew point of the air above the drying hops indicated that the drying power of the air was far from completely utilized, and that the present system of drying is inefficient and not economical. PETER J. F. WEBER

Simultaneous oxidation and reduction and molecular transpositions. Transposition of α-keto alcohols and the mechanism of alcoholic fermentation. AL. FAVORSKII. *Bull. soc. chim.* **43**, 551–63(1928).—This article is a general extension of F.'s work and theory on the transposition of α-keto alcs. On the basis of the theory of the intermediate formation of oxide-alcs. in the simultaneous oxidation and reduction and mol. transpositions (cf. *C. A.* **20**, 1593), F. discusses in more detail the mechanism of alcoholic fermentation. The reduction of nitro compds. to primary amines, hyposulfites to sul-

fites and hydrosulfides, and Et_2S_2 to EtSH are explained also according to analogous mechanisms. FREDERICK C. HAHN

The diastase content of grains and its practical utilization in the distillery. STAIGER. *Chem.-Ztg.* **52**, 679–80(1928); cf. *C. A.* **21**, 3913.—Maercker notes that in Russia sprouted rye is mashed without the addn. of malt. The diastase present in unmalted rye and wheat in normal unsprouted or ungerminated grains is sufficient without the addn. of malt to saccharify the starch present. High temp. drying may destroy some of the enzymes. The resulting alc. from grains malted in this manner is mild in flavor and contains only small quantities of fusel oil. This new method conserves coal and lessens labor. C. N. FREY

Dextrins contained in sweet and fermented mash. J. TROJAN. *Przemysl Chem.* **12**, 145–60(1928). A. C. Z.

Sugar: alcohol ratio and the stability of sweet wines. P. MALVEZIN. *Bull. assoc. chim. sucr. dist.* **45**, 396–9(1928).—In connection with his work on the prepn. of vaccines for the prevention of secondary fermentation, M. noted that he was always successful when the sugar/alc. ratio was less than 3, but never when the ratio exceeded 4. On reference to the data for over 100 samples of sweet wines received in his lab. on account of secondary fermentation, all were found to give a ratio of over 4 and generally nearer 6. Samples which had been recorded as keeping well had mean sugar/alc. ratios of: Gironde 1.3, Sauterne 3.65, Anjou 3.81, Gaillac 7.31. Conclusion: For sweet wines generally, the ratio should not exceed 3.5, but may reach 3.8 in Anjou wines, and 7 in Gaillac and similar wines in which secondary fermentation is usual. B. C. A.

The use of citric acid in the treatment of wine. JEANPRETRE. Neuchâtel Chem. Laby. *Mitt. Lebensm. Hyg.* **19**, 252–4(1928).—The addn. of citric acid to wines lacking in natural acidity or affected with white casse disease is advocated in Switzerland. At present it is illegal, though France, Italy, Spain and Greece have legalized the addn. of 50 g. per hectol. as a max. J. points out the difficulties of properly evaluating such wines on a basis of chem. tests. C. R. FELLERS

Uniform behavior of bottom-fermentation beer yeast in respect of fermentation, reproduction, and acid formation, on storage under water at various temperatures. F. STOCKHAUSEN AND F. WINDISCH. *Wochschr. Brau.* **44**, 557–64, 573–9(1927); cf. *C. A.* **22**, 2026, 2807.—Similar expts. to the earlier ones (*C. A.* **22**, 2026) were made with 3 other typical bottom yeasts, and with the same results. B. C. A.

The surface of yeast as a factor in fermentation. II. CLERK RANKEN AND JAMES R. BELL. *J. Inst. Brewing* **34**, 265–74(1928); cf. *C. A.* **22**, 300.—Peptone-tannin and CaC_2O_4, 2 constituents of brewery worts, were deposited on yeast, and the effect of such deposition was studied. Coating of the surface of yeast with peptone-tannin retarded the rate of fermentation, especially during the early stages, and also diminished the amount of reproduction. When traces of iron were present there was an accelerated fermentation. CaC_2O_4 coatings slightly retarded the reproduction, but when a higher rate of seeding was used, or with an increase in the coating an accelerated fermentation resulted. The retarded reproduction may possibly be attributed to toxicity of the CaC_2O_4, whereas the acceleration due to increase in coating or seeding is probably induced by the CaC_2O_4 preventing coherence of the yeast, which permits it to present a greater surface to the fermenting liquid. The peptone-tannin coatings on the other hand increased coherence of the yeast cells, and thus caused a retarded fermentation, because the increased coherence gave high heads which raised the yeast out of the liquid with consequently less yeast surface in contact with the fermenting liquid. P. J. F. W.

Fumigation of vineries with $Ca(CN)_2$ (WOODFIN) 15. Action of various kinds of EtOH on sheet Al and Lantal (RÖHRIG) 9. Paper pulp [alcohol produced in manufacture of] (Brit. pat. 283,851) 23.

WEICHHERZ, J.: **Die Malzextrakte.** Berlin: J. Springer. 388 pp. R. M., 32.

Distilling alcohol. U. S. INDUSTRIAL ALCOHOL CO. Brit. 283,701, Nov. 29, 1926. Alc., distd. from dil. alc. liquids as described in Brit. 278,211 (*C. A.* **22**, 2636) is, without cooling, dehydrated by distn. in the presence of a liquid such as C_6H_6 which forms an azeotropic mixt. An app. is described.

Beer. HOFBRAUHAUS WOLTERS UND BALHORN A.-G. Brit. 283,879, Jan. 18, 1927. Special beers having the properties of beers brewed in Pilsen are made by using the condensate of steam from brewing operations (with its contained heat if desired) for mashing and sparging. The condensate from the mash tuns and boiling coppers may be mixed with deep well water until it is brought to a hardness of 2°.

Yeast. AKTIESELSKABET DANSK GAERINGS INDUSTRIE. Brit. 283,969, Jan. 21, 1927. In using molasses for yeast and alc. production, acidifying and nutrient substances are used which do not contain SO_4 ions so that spent washes are obtained which are free from noxious products. The p_H of the wort is obtained by adding HCl, and NH_4 chloride, carbonate or phosphate may be used as nutrients. Brit. 283,970 specifies treating molasses, preparatory to its use for yeast and alc. production, with betaine-decompg. bacteria propagated on betaine or betaine-HCl (which process can be combined with the usual production of lactic acid by bacteria). The material may be then treated with an alkaloid-pptg. reagent such as tannic acid, may be decolorized by $Al_2(SO_4)_3$ and NaOH and the sulfates and carbonates present may be pptd. with a Ba compd. Silicates of Na and K may be used for removing excess Ba or Al ions. Ba aluminate also may be used in the purification and the treatment may be modified in accord with the character of the molasses to be treated.

17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

The investigation of essential oils. FREDERICK CHALLENGER. *Ind. Chemist* **4**, 315–9(1928).—The history of the work that revealed the nature of the essential oils, especially that of Wallach, is briefly covered. The methods for the isolation of the ketones, pulegone and thujone are described, as well as their chemistry and physiol. properties. The occurrence and chemistry of carvone and some of its derivs., of piperitone, and of 2 new terpenes (Δ^3-carene) and (Δ^4-carene), are discussed. Sylvestrene is thought not to occur in nature, but is probably evidence of the presence of a carene hydrocarbon, the trimethylene ring of which undergoes fission. The results are given of the work of Wallach, Ruzicka, and Semmler on the sesquiterpenes, followed by a short account of the work done on squalene. Bibliography. E. G. R. ARDAGH

Occurrence of arsenic in tobacco. H. POPP. *Z. angew. Chem.* **41**, 838–9(1928).—For the detn. of As in tobacco 200 g. is heated with fuming HNO_3 until the org. matter is completely decompd. and all Cl expelled. The soln. is evapd. repeatedly with H_2SO_4 to remove HNO_3, and As is tested for by the $HgCl_2$ colorimetric method. Tobacco from the Palatinate contained 5.1, from Macedonia 0.7, from Java 0.33, and from Brazil 4.6 pts. of As per million. This quantity is so small that no danger of poisoning is to be feared. B. C. A.

Improved technic of the thalleoquine reaction for quinine. H. W. VAN URK. *Pharm. Weekblad* **65**, 847–9(1928).—The sensitivity of this reaction, whereby a green color is developed by oxidation, is much greater if eau de Javelle (KOCl) is used in place of $Cl\text{-}H_2O$ or $Br\text{-}H_2O$. Quinine in a concn. of 1 to 40,000 is thus readily detected. Eau de Javelle has the additional advantage of being a more stable reagent. A. W. DOX

Liquor aluminii-tartarici D. A. B. 6. HERMANN MATTHES AND PAUL SCHÜTZ. Univ. Königsberg. *Apoth. Ztg.* **43**, 1023–4(1928).—The official German prepn. contains in addn. to Al acetotartrate considerable basic Al acetate. The pharmacopeial method of evaluation does not give the true content of Al acetotartrate. A positive result following the Zn acetate test of the official prepn is conditioned, as in the case of alsol, on a low content of tartaric acid. The ppt. arising in the Zn acetate test, and consisting chiefly of Al acetotartrate, is caused by the added EtOH, for which reason the satd. alc. Zn acetate test soln. can be omitted. W. O. E.

Estimation of cresol in liquor cresoli saponatus. K. FEIST. Univ. Göttingen. *Apoth. Ztg.* **43**, 1024–5(1928).—An improvement in the official German method consists in treating $^1/_{20}$ of the united petr. ether exts. in a tared 100-cc. beaker provided with glass rod with 5 cc. CH_2O soln. and 4 cc. 25% HCl on the water bath, the mixt. being stirred from time to time, then the residue comminuted by means of the rod, and finally brought to const. wt. in a desiccator. The residue amounted in most cases to 1.03 g. From 1 to 1.1 g. may be taken as the limits. W. O. E.

Artificial bath preparations. W. PEYER AND H. IMHOF. *Apoth. Ztg.* **43**, 1030–3, 1051–3, 1074–5(1928); cf. *C. A.* **22**, 302.—A descriptive treatment including analytical results in the examn. of certain com. prepns. W. O. E.

Testing aluminum acetate of the German Pharmacopeia. OTTO SCHMATOLLA. *Pharm. Zentralh.* **69**, 568–9(1928).—A critical commentary on the official German method, with certain suggestions for improvement. W. O. E.

Commercial cholesterol. I. LIFSCHÜTZ. *Chem.-Ztg.* **52**, 609–10(1928).—This

material, largely obtained in the manuf. of lecithin from cattle brain or from egg oil, is rarely pure, but quite generally contaminated with metasterol. W. O. E.

Superfluous pharmaceutical preparations. ANON. *Chem.-Ztg.* **52**, 611(1928).—A specific instance is cited with nautisan (trichloroisobutyl alc. and trimethylxanthine), which is nothing more than a mixt. of chloretone (introduced years ago by Parke, Davis & Co.) and caffeine. W. O. E.

Color reactions of atropine and certain of its related compounds. LAD. EKKERT. Budapest. *Pharm. Zentralh* **69**, 529–31(1928).—A study has been made of the various color changes produced on the addn. to 0.005–0.01 g. of the alkaloid (atropine, hyoscyamine, homatropine, novatropine) and powdered phenol (resorcinol, orcinol, pyrogallol, etc.), of 0.5–1.0 cc. concd. H_2SO_4. W. O. E.

Avoidance of errors in the evaluation of essential oils in drugs. R. BAUER. *Pharm. Ztg.* **73**, 920–1(1928).—Certain sources of error are discussed in connection with the extn. of essential oils from drugs, using pentane and brine as immiscible solvents. Reference is particularly directed to the technic of avoiding contamination of the org. solvent with traces of brine. W. O. E.

Evaluation of essential oils in drugs. HANS KAISER AND KARL EGGENSPERGER. *Pharm. Ztg* **73**, 1036(1928).—Reference is made to the paper by R. Bauer on the avoidance of errors in the above evaluation (cf. preceding abstract), with certain suggestions for improvement in the technic, notably in the recovery of oil possibly held in emulsified brine. An illustration of the app. used by the author is shown. W. O. E.

Concentrated phosphorus oil. P. BOHRISCH. *Pharm. Ztg.* **73**, 954–8(1928).—A discussion of P oils in general, and of exptl. results in particular, to det. the causes of deterioration in the official Ger. stock soln. The results show that the stability of a concd. P oil as prescribed in the Ger. Pharm. depends largely if not wholly on the quality of liquid paraffin employed. W. O. E.

One hundred and fifty years of pharmaceutical chemistry at the University of Königsberg. HERMANN MATTHES. *Pharm. Ztg.* **73**, 1041–52(1928).—This univ. began to function in 1544 with 11 professors and 200 students. Its pharm. faculty has included the following teachers and scientists: Karl Gottfried Hagen, Friedrich Dulk, August Friedrich Gustav Werther, Carl Graebe, Hermann Spirgatis, Heinrich Klinger and Alfred Partheil. Their activities are described in greater or less detail. W. O. E.

A reaction for the determination of the strength of spirits of gentian. TH. VON FELLENBERG. Swiss Bd. of Health Lab. *Mitt. Lebensm. Hyg.* **19**, 242–51(1928).—A roughly quant. colorimetric method is described as follows: To 5 cc. of the suspected spirits of gentian in a test tube add 5 cc. of low-boiling petroleum ether and shake vigorously. Transfer the mixt. to a small sepg. funnel and sep. Mix the ether-layer with 1 cc. H_2SO_4 (1:1), shake well and place in the water bath. As soon as the greenish blue color develops, remove from the water bath, cool and compare the color with known standards made up from $Co(NO_3)_2$ and $K_2Cr_2O_7$. A *microcolorimeter* is used to make the comparisons. The color intensities are given numerical values which may be used in evaluating samples of spirits of gentian. C. R. FELLERS

Absorption spectra. R. G. LOVARTE AND MARGARITA H. DE BOSE. *Univ. Nac. La Plata, Estudio Ciencias*, No. **82**, 197–208(1928); *Science Abstracts* **31A**, 372.—Absorption spectra of yerba maté and of its principal adulterants, caona, caneton and auta are compared. Standardizing an alc. soln. of yerba maté is discussed. H. G.

Alterations of pharmaceutical preparations in pharmacies. C. INVERNI. *Boll. chim. farm.* **67**, 427–34(1928).—The changes are caused by H_2O, O_2, CO_2, light and heat, hydrolysis, oxidation, change of p_H, catalytic decompn., crystn. M. J.

A few derivatives of anesthesine-urea. ST. WEIL AND J. ROZENTHAL. *Roczniki Chem.* **8**, 44–9(1928).—*Ethyl p-ureidobenzoate* (I) was obtained by heating p-$C_6H_4(NH_2)$-CO_2Et with urea several hrs. to 132°, until the liberation of NH_3 has ceased, m. 213° from 95% alc. It was refluxed 24 hrs. with AcCl in glacial AcOH and neutralized with $NaHCO_3$. After 0.5 hr. the sym. *acetyl deriv.*, $EtO_2CC_6H_4NHCONHAc$, settled out, m. 139–40° from ligroin. It is sparingly sol. in water, more sol. in alc., $CHCl_3$, acetone and benzene, very easily in ether. On refluxing with excess $(CH_3)_2$-C_2H_3COCl in $CHCl_3$ until the HCl liberation ceases, neutralization of the heavy oil with $NaHCO_3$ and recrystn. of the amorphous mass from water the sym. *ethyl p-isovalerylureidobenzoate*, m. 237°, is obtained. Sym. *p-α-bromoisovalerylureido deriv.*, m. 134–5° from dil. alc., was prepd. by heating I with $Me_2C_2H_3BrCOBr$ to 100° until no more HBr was evolved. Its *hypnotic* effect is not greater than that of *bromural* but it has a greater *sedative* effect. In the rabbit 0.3 g./kg. causes somnolence and sleep

after 1 hr.; 0.2 g./kg. causes a dog to lose its equil. but the excitation is less pronounced than with bromural. MARY JACOBSEN

Investigations of a few ipecacuanha preparations. E. HOST MADSEN. *Dansk. Tids. Farm.* **2,** 145–51(1928).—Two concd. prepns. (1:20) of ipecacuanha roots were examd. One of these prepns. was prepd. by percolation, the other by twice repeated infusion with H_2O. In both cases an addn. of HCl was used. The latter method is probably preferred, because it demands shorter time than the first one. Both prepns. contained nearly the total amt. of alkaloids present in the root, and could easily be standardized to a content of 0.10% alkaloids. With a content of 18% alc. they are stable and are well adapted for prepg. infusions and sirups of ordinary strength. O. A. NELSON

Tablets and limits of errors for tablets. T. P. ELKJER. St. Jakobs Apotek, Köbenhavn. *Dansk Tids Farm.* **2,** 151–76(1928).—E. discusses the uses and compns. of medicinal tablets, particularly with regard to errors that are allowed by the pharmacopeia of diff. countries, and also the compn. of tablets manufd. in countries where no definite laws or rulings to this effect exist. He repeats statements made in 1922 to the effect that tablets should contain active principles in uncombined or unchanged condition, that certain inactive portions, binders, etc., should be allowed, and that tablets should break up or dissolve in H_2O within a certain period of time. These suggestions have evidently not been incorporated in the Dan. Pharm. To discover the source of error E. prepd. 1278 tablets, using milk sugar as the base, the fineness of which ranges from 10 to 30 mesh. Also a large no. of other tablets were prepd. by pupils in his lab. by automatic machines. The diam. of die, pressure applied, etc., are discussed Tables and curves showing the results obtained are given. Conclusions: Errors due to machines should not exceed 10%. One may demand that the error in 95% of 100 tablets should be within $\pm$7.5%, and in 85% within $\pm$5%. O. A NELSON

Essential oils of travancore. VII. From the rhizome of ginger, Zingiber officinale. KISHORI LAL MOUDGILL. Maharaja's College of Science, Trivandrum. *J. Indian Chem. Soc.* **5,** 251–9(1928).—A study is made of the essential oils obtained from ginger and ginger scrapings. Fresh ginger and samples a yr. old were steam-distd. to give 2% of an essential oil. On vacuum distn. 70% zingiberene (I), b_3 119–123°, d_{30} 0.8638 $[\alpha]_D^{30}$ −64.0, n_D^{30} 1.4870, a sesquiterpene hydrocarbon, is obtained. I gives a nitrosite, m. 92–94°, and on standing 6 months the latter's m. p. rose to 113°. I exposed to the air 3 months did not form a nitrosite and had the following consts.: $[\alpha]_D$ +2.3, n_D 1.502, d. 0.9345. Bubbling air through I produced the same change in 8 hrs. Boiling I for 45 min. gives a viscous dextrorotatory product differing from that obtained by exposure to air and from isozingiberene. The properties of the product obtained by the heating are: fraction boiling below 265°, n_D^{30} 1.492, d_4^{27} 0.8777, $[\alpha]_D^{30}$ +6.9; fraction boiling 265–70°, n_D^{30} 1.491, d_4^{27} 0.8835, $[\alpha]_D^{30}$ +7.8. The oils obtained from green ginger and ginger scrapings have the following resp. consts., d_4^{27} 0.8800, 0.8816; $[\alpha]_D^{30}$ −26.4°, −9.85°; n_D^{28} 1.4878, 1.4862. D. H. POWERS

Determination of alkaloids by the mercurimetric method. AL. IONESCO-MATIU AND H. VARCOVICI. Univ. of Jassy. *Bull. soc. chim. România* **10,** 5–8(1928); *Bull. soc. chim. biol.* **10,** 932–6; cf. *C. A.* **21,** 2445, 3575; **22,** 3733.—A detn. of the 0.1 *N* NaCl equiv. (cf. *C. A.* **17,** 1769) of atropine, aconitine, papaverine, narcotine, brucine, veratrine and emetine using Mayer Valzer reagent (cf. *C. A.* **18,** 1631). P. THOMASSET

Titration of alkaloids in pharmaceutical preparations. AL. IONESCO-MATIU AND H. VARCOVICI. Univ. of Jassy. *Bull. soc. chim. România* **10,** 9–13(1928).—A comparison of the mercurimetric method (cf. *C. A.* **18,** 1631) and the French Codex method applied to pharmaceutical prepns. The mercurimetric method is just as accurate and quicker than the Codex method. P. THOMASSET

A new reaction for eserine or physostigmine. M. MOKRAGNATZ. *Bull. soc. chim. biol.* **10,** 905–8(1928).—The reagent used is prepd. by dissolving 1 g. of benzidine in 10 cc. of AcOH (strength not stated) and 30 cc. of water by aid of heat. The soln. is made up to 50 cc., is cooled and filtered, and preserved in brown glass bottles. The test is made by adding 1 or 2 drops of the reagent to the dry residue contg. the alkaloid then 1 drop of 30% H_2O_2 and observing the color formed. Twenty-one of the more common alkaloids as bases gave a yellow-orange color. Eserine as the free alkaloid or salt gave a violet color immediately or after a time according to the quantity present. The action was positive when eserine was mixed with other alkaloids. Chlorides and bromides give a blue or bluish green color and should be absent when the test

is made. If they are present with eserine the test shows a blue or bluish green color at first, which is followed by more or less violet color. L. W. RIGGS

Studies on the standardization of germicides. Preliminary report. WM. NYRI. *J. Am. Pharm. Assoc.* **17,** 449–53(1928).—An attempt to express the germicidal efficiency of PhOH, EtOH and tinct. of I in graphic form. Four organisms were tested in the absence of and in the presence of org. matter. A fifth is to be tried. Concn. and time are the chief factors. Formulas are given for efficiency of the substances with the 4 organisms. L. E. WARREN

Analysis of ginger and its preparations. J. F. CLEVENGER. *J. Am. Pharm. Assoc.* **17,** 630–4(1928); cf. *C. A.* **22,** 3956.—The U. S. Pharm. X gives no standards for ginger or its prepns. Place 50 cc. of fluid ext. of ginger or the equiv. amt. of the Et_2O ext. in a beaker and evap. on the steam bath to remove solvents. Transfer the residue to the special app. (*C. A.* **22,** 2439) and det. the volatile oil by the method therein described. Allow the volatile oil to stand until clear and det. its phys. consts. by the usual methods. Transfer the cooled H_2O from the app. to a separator and ext. it with Et_2O. Ext. the residue in the flask with Et_2O. Unite the exts. and evap. in a weighed beaker on the steam bath using a current of air. Dry the residue in a vacuum desiccator over H_2SO_4 for 2 hrs. and weigh as non-volatile Et_2O-sol. ext. This is considered the active principle. Dissolve the residue in EtOH and det. the I and sapon. values in suitable aliquot portions by the U. S. Pharm. methods. Prepns. of African, Cochin and Jamaican ginger were studied. The volatile oil in the fluid ext. ranged from 1.5 to 2.55%, α_D −46 to −52°, n_D 1.491–2, d. 0.877–85; the non-volatile Et_2O-sol. ext. ranged from 4 to 6.27%; I no. 23.1–36.5; sapon. no. 31–54.1. The values for the Et_2O ext. were practically identical in all samples. L. E. WARREN

Soap perfuming notes (ANON) **27.** New iodo derivatives of phthaleins (GREENBAUM) **10.** Soap [remedy for rheumatism] (U. S. pat. 1,684,336) **27.** Apparatus for cooling jets of air, anesthetic gases, etc. (Brit. pat. 283,583) **1.** Phthalamic acid (Can. pat. 282,407) **10.** Odor and constitution among the mustard oils. IV. Effect of F. substitution (DYSON) **11A.**

Anesthetic. AUGUSTE CHESNAIS. Can. 282,408, Aug. 14, 1928. An anesthetic results from a combination of Et phthalamate with Et *p*-aminobenzoylphthalamate-HCl.

Medicinal ampoules. I. G. FARBENIND. A.-G. Brit. 283,952, Jan. 22, 1927. Open-ended tubes are hermetically sealed with wax, ceresin, a cellulose ether or other suitable material which is inert to the contents of the ampoule thus formed. The seal may be perforated and the contents released drop by drop, at the time of use.

Medicinal dye preparations. CHEMISCHE FABRIK VORM. SANDOZ. Brit. 283,565, Jan. 15, 1927. Disazo dyes prepd. from 1 mol. proportion of a tetrazo compd. of the diphenyl series and 2 mol. proportions of an aminonaphthalenedisulfonic acid, or an aminonaphtholdisulfonic acid, in which the sulfo groups are in the 3- and 6-positions of the naphthalene nucleus, are mixed with salts of bile acids, to form prepns. which are toxic to certain blood parasites and are particularly suitable for certain veterinary uses; *e. g.*, Chloramine blue 2B, Chloramine blue 3B (trypan blue) or Trypan red is mixed with Na cholate, taurocholate, glycocholate or desoxycholate.

Anti-diabetic product. GEORGE B. WALDEN (to Eli Lilly and Co., to The Governors of the Univ. of Toronto). Can. 283,631, Sept. 25, 1928. An anti-diabetic product from the pancreas is prepd. by extg. the pancreas with a soln. that takes up the anti-diabetic hormone thereof without destroying it or prevents its destruction by enzymes, such as trypsin, in the pancreas, sepg. the soln. from the pancreas residue and treating it to sep. said hormone from the major part of the contaminating substances, forming a soln., and adjusting the H-ion concn. to the vicinity of the isoelec. point of a substance which, following upon the said adjustment, forms a ppt. including the anti-diabetic hormone, and sepg. and preserving the ppt. thus formed.

Albuminoids. S. POSTERNAK and T. POSTERNAK. Brit. 283,866, Jan. 17, 1927. The P-contg. compd. "α" obtained from egg yolk by the process described in Brit. 268,806 (*C. A.* **22,** 1416) is treated with a suitable proportion of an Fe salt so that there is obtained a product contg. Fe (not combined as a salt) which is quite similar to the compd. "β" described in Brit. 268,806. Numerous examples, details and modifications are given, for obtaining *therapeutic compds.*

Hormones. I. G. FARBENIND. A.-G. Brit. 283,493, Jan. 11, 1927. The process described in Brit. 279,123 (*C. A.* **22,** 2813) for purifying exts. of the active principle of the ovary is applied to other glands of internal secretion such as male germ glands and the exterior lobe of the hypophysis. The material may be extd. with an org.

solvent, the concd. mass taken up with ether, the ether evapd. and the residue taken up in diethylin. Impurities are removed by fractional pptn. with water and the filtered liquid is finally concd.

Vaccines. CURT RÄTH and HANS DAHMEN. Can. 283,325, Sept. 18, 1928. To make vaccines cultures of cocci are treated with solns. of the Na deriv. of 2-hydroxy-5-iodopyridine.

Vitamins. FIRM OF E. MERCK. Brit. 283,557, Jan. 14, 1927. Antirachitic prepns. are made by the action of activating light rays on ergosterol or exts. contg. it, such as yeast fat.

Vitamin extracts. AAGE W. OWE. Norw. 43,892, March 28, 1927. Vitamin exts. are prepd. from vegetable materials by extg. with alc. or similar liquids with a small addn. of alkali, preferably in absence of air. For instance, 20 kg. of carrots is ground and dried *in vacuo* at 50–60°. The dried and cooled mass is pulverized. The resulting fine powder is treated for 8–10 hrs. at 50–60° in an indifferent atm. with 10 l. of alc. to which has been added 100 g. of NaOH. After cooling the soln. is filtered, the clear filtrate is neutralized with HCl and the alc. is distd. off *in vacuo*. If necessary the NaCl can be removed from the vitamin-contg. residue by washing with water.

Vitamin extracts from marine oils. AAGE W. OWE. Norw. 44,017, May 16, 1927.—The oil is saponified, the soap is decomposed by acids, the fatty acids are removed and the residue is extd. with a suitable substance, for instance a fat solvent, a fatty oil or a mixt. of both. The process is as much as possible carried out in absence of light and air. For instance, 10 kg. of fish oil is saponified with 2.5 kg. KOH dissolved in 20 l. H_2O. The heating is continued until sapon. is complete or nearly complete. The mixt. is cooled to 30° and an equivalent amt. of HCl is added with stirring, as quickly as possible. When the fatty acids have accumulated in a top layer the aq. bottom layer is extd. with 5 kg. of cotton oil by vigorous stirring for 2 hrs. in an O-free atm. After sepn. the oil will contain a large part of the vitamins contained in the original oil and will be practically free from the unpleasant taste of the original oil. Cf. *C. A.* **21**, 3992; **22**, 845.

Physiologically active extracts. WILLI LUDWIG and OTTO SCHAUMANN (to Winthrop Chemical Co., Inc.). Can. 283,621, Sept. 25, 1928. Physiol. active exts. are prepd. from the hearts of warm-blooded animals, by extg. the fresh water-contg. hearts with acetone, preferably under a neutral or weakly alk. reaction and then freeing according to one of the known methods the acetone soln. from the ballast substances. The exts. are intended to be used in the treatment of cardiac diseases.

Acridine derivatives. I. G. FARBENIND. A.-G. Brit. 283,510, Jan. 11, 1927. Nitro-9-aminoacridine derivs. which contain a further basic residue either in the 9-amino group or in the nucleus are prepd. either by condensing a nitro-9-chloroacridine with a base contg. at least 2 N atoms (one being of primary character) or by condensing a nitro-9-chloroacridine contg. a basic group with NH_3 or a primary or secondary amine. 9-Ethers may also be used instead of 9-chloroacridines. The products are strong *bactericides*. Examples are given of the production of 2-ethoxy-6-nitro-9-(β-diethylaminoethylamino)acridine, 2-ethoxy-6-nitro-9-(γ-diethylamino-β-hydroxypropylamino)acridine, 2-ethoxy-6-nitro-9-(*p*-β-diethylaminoethylaminophenylamino)acridine, 2-ethoxy-6-nitro-9-(*p*-γ-diethylamino-β-hydroxypropylaminophenylamino)acridine, 2-ethoxy-6-nitro-9-(*p*-γ-diethylaminoethylamino-β-hydroxypropylaminophenylamino)acridine, 2-ethoxy-3,6-dinitro-9-(*p*-β-diethylaminoethoxyphenylamino)acridine and 2-β-diethylaminoethoxy-6-nitro-9-aminoacridine and intermediates for the production of compds. of this character.

Emulsions for use in ointments, shaving creams, etc. T. D. KELLY. Brit. 283,711, Dec. 13, 1926. Aq. emulsions are prepd. by heating a mixt. of water 1–3, oils, fats or solidified oils 1 and a mixt. of glycerol and starch (in the proportions of 2–3:1) 0.5 part. For use as a liniment, the starch-glycerol mixt. is replaced by 0.1 part of a mixt. of equal proportions of starch and glycerol and a small proportion of NH_3 is added. Other ingredients may also be added and the compn. may be sterilized with ultra-violet light.

18—ACIDS, ALKALIES, SALTS AND SUNDRIES

E. M. SYMMES

The oxidation of ammonia. BRUNO WAESER. *Chem. App.* **15**, 169–71, 183–5 (1928).—A review of work in Germany after 1914 and in America, with calcns. of difference in cost of HNO_3 from NH_3 and Chile $NaNO_3$, and comparative costs of NO

for H_2SO_4 chambers from NH_3 and $NaNO_3$. Methods of operating in England and America are mentioned, with 5 cuts of app. J. H. MOORE

Catalytic oxidation of ammonia. VII. L. ANDRUSSOV. *Z. angew. Chem.* **41,** 205–6(1928); cf. *C. A.* **22,** 716.—A reply to criticism by Raschig of previous work (cf. *C. A.* **22,** 668). A. re-states his reasons for believing that nitroxyl, HNO, is an intermediate product of the catalytic oxidation of NH_3. **Reply.** F. RASCHIG. *Ibid* 207. **VIII.** L. ANDRUSSOV. *Ibid* 262–3.—Views on the mechanism of the reaction between NH_3 and O_2 in presence of Pt as previously published are summarized. Nitroxyl is regarded as the intermediate product. The large production of N_2 at high temps. and low velocities is not explicable as due to thermal decompn. of NH_3 or reaction between NH_3 and nitric oxide. It is produced in an explosion zone in front of the catalyst, which zone disappears with increasing gas velocity. The conditions of reaction with excess of O_2 suggest the presence of a layer of O_2 at the catalyst surface, whereby nitroxyl and nitric oxide are formed in preference to di-imide. In absence of a catalyst N_2 is the chief product of oxidation of NH_3. B. C. A.

The formation of ammonia in the electric discharge in the presence of mercury. A. J. A. VAN DER WYK. Univ. de Genève. *J. chim. phys.* **25,** 251–89(1928).—An elec. discharge of 10,000 v., at 50 cycles per sec. was passed from a Hg electrode through a mixt. of N_2 and H_2 at 45° and 100 mm. pressure. The formation of NH_3 takes place according to the reactions: $H_2 = H^+ + H + \epsilon$, $H^+ + H_2 = H_3^+$, $H_3^+ + Hg = HgH_3$, $^1/_2 N_2 = N^+ + \epsilon$, $HgH_3 + N^+ = NH_3 + Hg$. The reaction takes place on the surface of the Hg and is assumed to be heterogeneous. Larger amts. of NH_3 were obtained by increasing the surface of the Hg. The optimum speed of the reaction is attained with a mixt. of 2 vols. H_2:1 vol. N_2. The presence of traces of O_2 renders the Hg less active. E. G. VANDENBOSCHE

Preparation of alkali aluminates by action of chlorides on alumina in presence of water vapor. LOUIS HACKSPILL AND JEAN SALOMON. *Chimie et industrie* Special No., 415–6(April, 1928); cf. *C. A.* **21,** 4031.—On heating calcined Al_2O_3 and dry NaCl in a current of superheated steam the reaction $6NaCl + Al_2O_3 + 3H_2O = 2Al(ONa)_3 + 6HCl$ begins at 600° and proceeds quite rapidly. At 800°, 80% of the Al_2O_3 is transformed in 40 min. A lower yield was obtained in vacuum than at atm pressure. In the metallurgy of Al, it is necessary to use a very pure Al_2O_3, generally obtained by treating bauxite with Na_2CO_3 or NaOH. Since NaCl + $2H_2O$ in vapor form reacts like NaOH under certain conditions, 2 parts of bauxite contg. too much SiO_2 to be used for the manuf. of Al (Al_2O_3 60, SiO_2 11, Fe_2O_3 4, TiO_2 3, H_2O 22%) were mixed and heated with 5 parts NaCl. After 2 hrs. at 830° Al_2O_3 was pptd. with CO_2, giving yields of 73–82% of the amt. contained in the bauxite taken. A bauxite suitable for the manuf. of Al (Al_2O_3 61, SiO_2 2, Fe_2O_3 22, TiO_2 1, H_2O 14%) under the same conditions gave yields not exceeding 55%; and a bauxite of intermediate compn. (SiO_2 7%) gave a 67% yield. In all cases the Fe remained insol., but a considerable proportion of the SiO_2 was dissolved. The difference in the behavior of the Al_2O_3 is attributed to the fact that Al silicate reacts much more readily than hydrated Al_2O_3, which was confirmed by the fact that kaolin was almost quant. converted into $2SiO_2.Al_2O_3.2Na_2O$ in 2 hrs. at 900° and atm. pressure. A. PAPINEAU-COUTURE

Industrial treatment of phosphorites. S. I. VOLFKOVICH AND V. P. KAMZOLKIN. *J. Chem. Ind.* (Moscow) **5,** 474–80(1928).—While rock phosphates rich in P_2O_5 are usually treated by the thermic process which consists in heating them with C and SiO_2 above 1350° and distg. H_3PO_4, Russian phosphorites, which generally have a low P_2O_5 content, should be treated by the wet process which consists in decompg. the phosphates by H_2SO_4. The latter process was investigated with a view to rendering it more economic by obtaining by-products which have a market value. Phosphorite powder is repeatedly decompd. by either 15 to 20% H_2SO_4 or by a mixt. of H_2SO_4 and $(NH_4)_2SO_4$ to obtain $NH_4H_2PO_4$. After decantation or filtration the solid residue, which usually contains 45 to 70% gypsum, variable amts. of silicates and sesquioxides and about 2 to 4% P_2O_5 as phosphates, is suspended in powder form in H_2O and treated by NH_3 and CO_2: $CaSO_4 + 2NH_3 + CO_2 + H_2O = (NH_4)_2SO_4 + CaCO_3$. $(NH_4)_2SO_4$ and most of the phosphates dissolve. About 1.5 to 2% of the phosphates, which were in H_2O-insol. form, ppt. together with $CaCO_3$. The soln. contg. $(NH_4)_2SO_4$ may be concd. by evapn. to obtain the solid fertilizer, and the ppt. of $CaCO_3$ transformed into $Ca(NO_3)_2$ by action of HNO_3. All the products obtained from the phosphorite are thus transformed into fertilizers. This method of treatment is still in the lab. stage. B. N.

Manufacture of copper sulfate from brass turnings. I. B. EVTUSHENKO. *J. Chem. Ind.* (Moscow) **5,** 522–3(1928); cf. Kazarnovskii and Zvenigorodskaya, *C. A.* **22,** 3119–20.—The advantage of using brass turnings rather than Cu is the lower cost

of the former; the disadvantage is the presence of a large quantity of Zn which must be removed. The usual compn. of brass is: Cu 68.80, Zn 29.23, Fe 2.41%. The following 2 methods of using brass turnings in the manuf. of $CuSO_4$ are at present in use in Russian factories. In the first method brass turnings are roasted to obtain various oxides depending on the extent of calcination, and these oxides are put into dil. H_2SO_4, whereupon all CuO dissolves, but Zn and Fe oxides dissolve only partly. The undissolved part of the metal is again roasted. The soln. obtained gives in 1 crystn. $CuSO_4$ contaminated by Zn, which must be recrystd. This method involves a considerable expense of fuel, lengthy crystns., and an undesirable by-product in the form of mother-liquors contaminated with very much Zn. In the second method the turnings are subjected for 2 weeks to a treatment with hot H_2SO_4 without access of air. This leaves Cu undissolved, but Zn dissolves until only 0.25 to 0.5% of the latter metal remains. Then the treatment is continued with fresh H_2SO_4 while blowing in air, whereupon Cu dissolves and $CuSO_4$ is finally obtained from the soln. by crystn. E. shows that the second method, which has the inconvenience of being lengthy, can be improved by the use of catalyzers which, on being added to H_2SO_4, reduce the time required for the soln. of Cu. The following catalyzers have been tried: compds. of Al, Mn, P, Cr, HNO_3, etc. The best results were obtained with Cr, its role being that of a carrier of O_2. When H_2SO_4 contains 0.4% of its weight of Cr the speed of soln. of Cu in a current of air is increased 4 to 5 times, and the soln. obtained contains not more than 0.2% Cr, too small a quantity to influence the purity of the $CuSO_4$ crystals obtainable. The part of the operation which consists in dissolving away the Zn from the Cu can be accelerated by replacing H_2SO_4 by HCl, which acts much more energetically on the turnings. Whereas 2 weeks are required to dissolve the Zn of the brass by H_2SO_4, 8 hrs. with HCl are sufficient for lowering the Zn content from 29% to 1.7 to 2.0%. The strength of the HCl soln. to be used for this purpose is 17 to 18° Bé. (*i. e.*, 0.14 to 0.16 g. HCl per cc.), and double the theoretical amt. must be used. At first the acid must be heated with great care, the reaction being very violent on account of H_2 coming off. The soln. obtained may, after an addn. of Zn, be used as com. $ZnCl_2$. The main difficulty of this process is the necessity of operating in an app. resistant to HCl. A drawing of a suitable app. is given. Patents are applied for. BERNARD NELSON

Manufacture of potassium chloride from Solikamsk sylvite. F. F. WOLF AND V. S. YATLOV. *J. Chem. Ind.* (Moscow) **5**, 274–9(1928).—It has been shown previously (Volf and Yatlov, *C. A.* **22**, 3495) that fairly pure KCl can be obtained by crystg. Solikamsk sylvite from water, because the Mg salt content of the sylvinite is very small. However, by the repeated use of mother liquors for soln. and crystn. of new quantities of sylvite the former gradually become enriched by constantly increasing amts. of $MgCl_2$. V. and Y. studied the extent to which conditions of pptn. of KCl are affected thereby. Expts. show that increase of $MgCl_2$ content of the solns. up to 120 g. per 1000 g. H_2O has no influence on the speed of soln. of KCl and NaCl. The soly. of NaCl in satd. solns. of KCl which contain also a little $MgCl_2$ decreases with the increase of time, but it increases with temp. when the $MgCl_2$ content of the solns. is over 100 g. per 1000 g. H_2O. When the $MgCl_2$ content of hot solns. increases over the above limit NaCl is pptd. on cooling, even if they are satd. with KCl. When the $MgCl_2$ content of the solns. reaches the above limit it is practically impossible to obtain from them pure KCl, whether they are completely satd. with KCl or not. It follows that the presence of a considerable amt. of carnallite in sylvite renders the conditions of KCl extn. considerably more difficult. BERNARD NELSON

Natural nitrate of soda. A. L. *Rev. agr. Maurice* **5**, 113–6(1928).—A brief history of the Chilean nitrate industry, statistics of nitrate production, and comparative prices of the various N fertilizers are presented. F. W. ZERBAN

Lead compounds and magnesia. WEBSTER NORRIS. *India Rubber World* **78**, 55 7, 71–2(1928).—Their characteristics and uses are described. C. C. DAVIS

Mechanical developments in the potash industry. R. EHRHARDT. *Chem. Fabr.* 1928, 277–8.—The much larger outputs which are necessary to render potash manuf. profitable today have involved alterations in the methods of handling. Wagons of crude salt are now moved and tipped mechanically. The salt is broken in mills in which it falls upon beaters striking upwards. These produce grains of about 4 mm. diam. with little fines, and are built with through-puts of up to 250 tons per hr. With high outputs it is better to reduce to a certain size in beater mills and to finish the crushing with rollers. To ecomomize power, the feed to these secondary mills is passed through a vibrating sieve, one design of which is described. B. C. A.

Technic of the concentration of graphite by flotation. CHARLES BERTHELOT. *Chimie et industrie* Special No., 397–403(April, 1928).—A general description of the

flotation process as applied to the concn. of graphite ores, with a brief discussion of the cost of production in Canada and in the U. S. A. Papineau-Couture

The bromine industry in Alsace. C. Horst. *Chimie et industrie* **Special No.,** 404–5(April, 1928).—Brief outline of the process of extn. of Br in the Alsatian potash mines and of its possibilities of development with increased Br demand in the chem. industry. A. Papineau-Couture

Direction for polishing aluminum. O. G. Styrie. *Apparatebau* **40,** 174–5(1928).—Five formulas for polishes are given, with directions for producing various effects. J. H. Moore

Helium developments. R. R. Bottoms. *Chem. Markets* **23,** 250–2(1928). E. H.

Purification of helium. J. Williamson Cook. Bur. of Standards. *Phys. Rev.* **29,** 920(1927).—He contg. approx. 3% air with a trace of Ne and H_2 can be almost completely purified by passing it at a slow rate at atm. pressure over suitably treated cocoanut charcoal. Data are given for the absorption of air per g. of the charcoal at various temps. between —78° and —209°. W. W. Stifler

Preparation of hydrogen for military aeronautics. Jean Salomon. Univ. de Strasbourg. *Chimie et industrie* Special No., 406–7(April, 1928).—The requirements of a process suitable for use in the field in wartime are briefly discussed. Siemens and Schuckert in 1911 proposed the action of Si or Si alloys on alk. solns. according to the reaction $Si + 2NaOH + H_2O \longrightarrow Na_2SiO_3 + 2H_2$, which takes place slowly in the cold and requires a temp. of about 80° to proceed at a satisfactory rate. The process can be cheapened appreciably by using the resultant soln. to obtain an addnl. amt. of H_2 almost as great as that obtained in the 1st reaction, by adding to the still warm soln. a further quantity of Al alloy or scrap Al according to the equations: $Na_2SiO_3 + H_2O \rightleftharpoons SiO_2 + 2NaOH$; $2Al + 6NaOH = 2Al(ONa)_3 + 3H_2$. About 80% of the NaOH produced by the 1st reaction can be utilized in the 2nd reaction, complete utilization being prevented by the fact that when the diln. reaches a certain value the degree of hydrolysis of the Na_2SiO_3 falls to a very low value. In this way, the reaction of 1 kg. Si and 480 g. Al on 2.8 kg. NaOH gives 200 g. H_2 (or about 2240 l.). A. Papineau-Couture

The nitrogen industry. R. E. Slade. *J. Soc. Dyers Colorists* **44,** 265–8(1928).—A review is made of the development of the N industry of the world. Some details of the process of N fixation used by The Synthetic Ammonia and Nitrates, Ltd., at Billingham are given. This factory, which represents the British N industry, uses the Haber process with a pressure of 200 atms. The output is 235 tons of NH_3 per day. This is converted chiefly into $(NH_4)_2SO_4$ by means of the gypsum process which yields a chalk by-product of use in agriculture and in the cement industries. L. W. R.

Technology, uses and analysis of selenium. J. B. Krak. *Glass Ind.* **9,** 152–3 (1928). H. F. K.

The production and uses of tellurium. G. Malcolm Dyson. *Chem. Age* (London) **19,** No. 479, Met. Sect., 17–9(1928). E. H.

Wood charcoal as an adsorbent for gases. A. Magnus, E. Sauter and H. Kratz. Inst. für Phys. Chem. Frankfurt, a. m. *Z. anorg. allgem. Chem.* **174,** 142–4(1928).—The adsorption curves of CO_2 and SO_2 on wood charcoal at low equil. pressures (0–30 mm.) show anomalous curvatures. The magnitude of the effect depends on the previous history of the charcoal. Long-continued, high-temp. evacuation accentuates the effect. If the charcoal be boiled with HCl, and washed with boiling H_2O, the anomalous results are no longer obtained and the low pressure adsorption curves are linear. The anomalous results are best explained by assuming alkali or alkali-earth oxides as impurities in the untreated charcoals. The metal oxides are the source of the apparent higher adsorption potentials. R. L. Dodge

Rotating sulfur burners. W. F. Alewyn. *Arch. Suikerind.* **36,** 465–8(1928).—S contg. a large amt. of bituminous matter cannot be burned efficiently in the old-type burner. The Glens Falls Machine Works has constructed a rotary burner, similar to a granulator, which overcomes the difficulty mentioned; it has not been tried yet in Java. Expts. will be made with an old-type S burner into which is built a rotating cylinder, with the object of stirring the burning S. Both app. are illustrated. P. R. Pekelharing

Re-opening of the Chilean saltpeter mines. Constantin Redzich. *Apparatebau* **40,** 198–201(1928).—General remarks on modern methods and app. J. H. Moore

Colloid-technical general reviews. II. Plastics. Josef Obrist. *Kolloid-Z.* **45,** 82–92(1928).—The evolution of the plastics industries seems to take a course similar to that followed by the older rubber industry, developing first along strictly empirical

lines and only recently beginning to find a rational groundwork in colloid chemistry. Plastics are defined as materials that are horny and elastic at ordinary temp. but can be molded at higher temp. They include (1) cellulose plastics, (2) artificial resins and (3) protein plastics. Artificial silk, paper and varnish resins are excluded. After a discussion of "colloid nature and plasticity," each of the three classes of plastics is reviewed. There are about 100 literature citations. F. L. BROWNE

Dihydroxydiphenyldimethylmethane and its use in plastics. CHARLES W. RIVISE. *Plastics* **4,** 429–30, 448(1928).—The method of prepn. and the various applications of this compd. are discussed. The information given is taken from 11 U. S. patents that were issued to W. A. Beatty. FREDERICK C. HAHN

Effect of adding oxidants in the steeping process in bleaching. HALLER AND P. SEIDEL. *Z. angew. Chem.* **41,** 698–702(1928).—Contrary to earlier views it is shown that the addn. of oxidizing agents at the steeping stage in the process of bleaching is undoubtedly advantageous. Oxidizing agents, however, which readily give up their O in the alk. bath are to be avoided; the best results are obtained with "aktivin" (Na *p*-toluenesulfonchloroamide), which affords on hydrolysis neutral easily sol. products removable by washing. The use of such agents enables the bleaching to be conducted at lower pressures, and a steeping period of 4 hrs. serves instead of 6–8 hrs. as formerly. Satisfactory results are not obtained by steeping with lime alone; a further treatment with 2% NaOH soln. gives a well-bleached product. In the steeping process the loss in weight is proportional to the alkali consumed and the org. material dissolved, and the function of the oxidizing agent appears to be that of converting the impurities into products sol. in alkali. Microscopical examn. shows that the operation removes pectins and the cuticle incrustation without impairing the tensile strength of the material. Inferior results with lime alone appear to be due to the failure of this reagent to act on the cuticle. Oxycellulose is only formed to a slight extent as shown by the Cu numbers and "boiling-out" numbers of the steeped material. The best results are obtained with a bath contg. about 10% of aktivin (corresponding to 2% of "active" Cl) and 2% NaOH soln. For the tests, crude cellulose from nettles, which gave no starch reaction with I, was used. B. C. A.

Removing dried ink from vulcanite fountain pens. R. DITMAR. *Chem.-Ztg.* **52,** 123(1928).—The greenish gray discoloration caused by prolonged immersion in water or aq. solns. to remove dried ink may be avoided by using a soln. of $Na_2S_2O_4$, which effects a rapid cleaning without affecting the vulcanite. B. C. A.

The most important metal stains. H. KRAUSE. *Apparatebau* **40,** 172–4(1928).—Formulas are given for staining Fe, Ag and Cu and its alloys, with directions. J. H. M.

Technological notes [removal of CO_2 from gases for NH_3 synthesis] (NOVÁK) **21.** Carbon black. I. A study of its volatile constituents (JOHNSON) **30.** Apparatus for drying $(NH_4)_2SO_4$ crystals (Brit. pat. 283,717) **1.** Fertilizers and Mg salts (Brit. pat. 283,558) **15.** Water gas and H (Can. pat., 281,814) **21.**

Hydrochloric acid from waste liquors of fuller's earth manufacture. SIRIUS-WERKE A.-G. Ger. 464,086, July 26, 1928. The free acid in the waste liquors is neutralized with metals or compds. of metals whose chlorides yield HCl on thermal decompn. The waste liquors are evapd., *e. g.*, on drum driers, and the chlorides scraped off.

Synthesis of hydrocyanic acid. NORSK HYDRO-ELEKTRISK KVAELSTOFAKTIESELSKAB. Norw. 44,822, Feb. 6, 1928. A gaseous mixt. of N_2 and carbohydrates without any considerable amt. of CO is passed through an elec. high-voltage arc furnace preferably of the Birkeland-Eyde type with metallic walls which are cooled by water to a temp. not at any point exceeding 400°. The reaction gases which have a temp. of 400–600° are cooled in an app. designed for steam generation to a suitable absorption temp. and are then passed through an alk. absorption app. The residual gas is returned into the process in const. circulation. The strong cooling of the furnace walls is necessary to prevent the formation of soot.

Purification and drying of sulfur dioxide. AKTIESELSKAPET RAOUL PICTET & F. THARALDSEN. Norw. 43,929, April 29, 1927. The gaseous SO_2 to be dried and purified is passed through a spray of liquid SO_2 under reduced pressure. The H_2O is removed in the form of ice.

Treating asbestos ore. SAMUEL H. DOLBEAR (to Selective Treatment Co., Ltd.). U. S. 1,684,365, Sept. 11. Asbestos is sepd. in pencil-like form from assocd. rock, by an app. which is described. U. S. 1,684,366 specifies subjecting the ore to underwater treatment, loosening the asbestos and at the same time preserving its natural

length, causing the loosened asbestos to pass into a body of water adjacent the comminuting zone, and maintaining the loosened asbestos in suspension until overflowed. An app. is described.

Sulfuric acid. Walter A. Patrick and Ernest B. Miller (to Silica Gel Corp.). U. S. 1,683,694, Sept. 11. In the contact process, SO_2 and an O-supplying gas are brought into contact with a hard active mass of porous gel, such as silica gel, assocd. with a substance such as Pt which catalyzes the conversion of SO_2 to SO_3; the gel has pores of such size that it will absorb water vapor to such an extent as to contain at least 21% of its own wt. of H_2O when in equil. with H_2O vapor at 30° and a partial pressure of 22 mm. Hg.

Sulfuric acid. Hugo Petersen. Can. 283,515, Sept. 25, 1928. H_2SO_4 is manufd. from sulfurous gases, particularly from gases having a variable percentage of SO_2, by first treating the gases by any known contact process, and treating the remaining sulfurous gases in a second plant in which the SO_2 is oxidized by oxides of nitrogen, the second plant consisting of towers filled with a small acid-resisting packing material of high mechanical resistance, and rinsed with a soln. of nitrosylsulfuric acid in H_2SO_4.

Removal of arsenic from sulfuric acid. M. A. Kolontayev Russ. 1514, Sept. 15, 1924. Warmed crude H_2SO_4 is led through lead containers filled with porous material (coke, metallized pumice stone, etc.), which is a good elec. conductor; this acts as a cathode. Anodes are placed in cylindrical porous containers and these are placed in the cathode material. An elec. current passed through this system deposits metallic As or forms AsH_3, which escapes into the air.

Production of hydrogen and phosphoric acid. Norsk Hydro-Elektrisk Kvaelstofaktieselskab. Norw. 45,018, April 2, 1928. Phosphorus is oxidized by CO_2 under known conditions, the formed P compds. are removed from the CO-contg. gas, which is converted with steam to H_2 and CO_2, the latter being used again for the oxidation of new amts. of P under const. circulation. The process may be carried out in combination with the electrothermic production of P in the way that the CO_2 gas is introduced in the furnace before the condensation of the P vapors.

Bottles for hydrofluoric acid, etc. H. O. Traun (trading as Traun & Söhne vorm Harburger Gummikamm-Compagnie). Brit. 283,868, Jan. 18, 1927. Bottles or other containers are made from or covered with a phenol-CH_2O condensation product or other suitable artificial resin, preferably mixed with finely divided graphite, and are given a protective coating of "varnish or other material." The necks may have an external layer of hard rubber which may be screw-threaded.

Ammonia. Norsk Hydro-Elektrisk Kvaelstofaktieselskab. Norw. 43,786, March 7, 1927. In the same app. 2 different catalyzers are applied, the first one being very little sensitive to the effect of poisons and working irregularities and relatively little active, while the second catalyzer should be very active and may be more sensitive to poisons and working irregularities.

Ammonia. Norsk Hydro-Elektrisk Kvaelstofaktieselskab. Norw. 43,787, March 7, 1927. Hot gas is introduced at one or more places in the catalyzer chamber. When gas is introduced at 2 or more sep. places, the temp. is kept different in order to be able to maintain the most favorable temp. or temp. difference in the catalyzer.

Separation of ammonia from gas mixtures. Georg F. Uhde. Can. 283,221, Sept. 11, 1928. NH_3 is sepd. from gases, especially from a gas mixt. of N and H under pressure subjected to a catalyst, by evapg. under low pressure the liquid NH_3 sepd. from the previously cooled gas mixt. and leading it to meet the mixt. contg. NH_3 in counter current for the purpose of cooling it and adding new quantities of NH_3 to the gas mixt. to be cooled.

Catalyst for ammonia synthesis. Georg F. Uhde. Can. 283,222, Sept. 11, 1928. A catalyst contg. Fe, Al, C, N and alkali is treated in dry state in a catalyst furnace at a moderate temp. suitably under pressure with H or with H and N before it is used for the synthetic production of NH_3.

Catalyst for the manufacture of ammonia. Norsk Hydro-Elektrisk Kvaelstofaktieselskab. Norw. 44,446, Oct. 10, 1927. Natural magnetite is ground to slime and concd. by magnetic sepn. The concd. slime is treated with 50% HNO_3 to which has been added a minor quantity of HF. No more of the acid should be applied than is required for making a stiff paste. The mass is heated to 90–100° for 1 hr. while stirring. Then water is added till the concn. of the acid has been reduced $^1/_2$, after which the mass is kept for 1 hr. at 100°. Then the acid is removed by washing and the gang and the formed sulfur are sepd. from the residue, which is eventually subjected to a magnetic sepn. The purified slime is fused in an elec. arc furnace with addn. of a suitable amt. of K Al nitrate. After cooling the mass is pulverized and filled into

the catalyzer chamber where it is reduced by gentle heating in a H_2-N_2 mixt. At a temp. of 500° under pressure this catalyzer will give a very high percentage of NH_3.

Apparatus for the synthesis of ammonia. NORSK HYDRO-ELEKTRISK KVAELSTOFAKTIESELSKAB. Norw. 44,823, Feb. 6, 1928. Structural features.

Hydrogen-nitrogen mixtures for the ammonia process. NORSK HYDRO-ELEKTRISK KVAELSTOFAKTIESELSKAB. Norw. 44,486, Oct. 17, 1927. A mixt. of H_2O and air is passed through glowing carbon, the required energy being applied in the form of elec. energy, the carbon mass in the generator acting as a resistor. The process is carried out at a lower temp. than the ordinary water-gas process.

Purification of hydrogen-nitrogen mixtures for production of ammonia. BIRGER F. HALVORSEN (to The Norsk Hydro-Elektrisk Kvaelstofaktieselskab). Can. 282,906, Aug. 28, 1928. H-N mixts. are purified by washing with a liquid NH_3 contg. inorg. salts (Cu_2Cl_2, NH_4NO_3) capable of reacting with H_2O, CO_2 and CO. ($Ca(NO_3)_2$, metal chlorides, cyanides and nitrates may be used.)

Purification of gases for the ammonia process. NORSK HYDRO-ELEKTRISK KVAELSTOFAKTIESELSKAP. Norw. 44,232, July 25, 1927. The mixt. of H_2 and N_2 is purified by means of org. or inorg. compds., for instance nitrates, suspended in liquid NH_3. Several different salts may be used simultaneously, each salt having a special purifying power.

Treating hygroscopic salts. NORSK HYDRO-ELEKTRISK KVAELSTOFAKTIESELSKAB. Norw. 44,289, Aug. 8, 1927. Hygroscopic salts, particularly $Ca(NO_3)_2$, are treated with acids such as H_2SO_4 or H_3PO_4 so as to form an insol. or difficultly sol. salt coating on the surface of the grains. The saltpeter is afterwards treated with a base, preferably gaseous NH_3 for neutralization of the free acid.

Alkali metal nitrates and nitrosulfonic acid. I. G. FARBENIND. A.-G. Brit. 283,771, April 25, 1927. In forming alkali metal nitrates by the action on alkali metal chloride solns. of HNO_3 or N oxides, residual N oxides escaping with the HCl formed are absorbed by H_2SO_4 (suitably under 6–20 atm. pressure) to form nitrosulfonic acid. Brit. 283,772 specifies forming alkali metal nitrates by reaction on chloride solns. with N oxides admixed with O-contg. gases under pressures up to 50 atm. (suitably at a temp. of 35°) and with use of solns. of such concn. that the nitrate formed is deposited in the solid state. Cf. *C. A.* **22**, 2815.

Oxide-free halide of a rare refractory metal. JOHN W. MARDEN and HARVEY C. RENTSCHLER (to Canadian Westinghouse Co., Ltd.). Can. 283,251, Sept. 11, 1928. As an example, an oxide-free *potassium uranium fluoride* is pptd. from a soln. contg. uranyl acetate, an alkali metal fluoride, HF and HCO_2H by exposing to ultra-violet light. The water of crystn. is removed from the ppt. by fusing with NaCl and KCl.

Lead salts. STANLEY C. SMITH. Can. 283,213, Sept. 11, 1928. Pure Pb salts of the acids of As, Sb, Cr, W, Mo or U are manufd. from $PbCl_2$ by satg. boiling H_2O with $PbCl_2$ and NaCl, pouring the hot soln. into an almost equal vol. of cold water, removing the pptd. $PbCl_2$ from the liquor, and washing it with H_2O, and then maintaining this $PbCl_2$ in suspension in a hot or boiling soln. in H_2O of a salt of the respective acid.

Metallic phosphides. WILLIAM KOEHLER. Ger. 463,840, July 19, 1928. Finely divided metals, *e. g.*, Cu, are mixed with finely divided or dissolved white or red P and heated before or after compression, with or without admixture of lubricating agents, *e. g.*, graphite. Cf. *C. A.* **22**, 1219.

Alumina. METALLBANK UND METALLURGISCHE GES. A.-G. Brit. 284,131, June 7, 1927. Disintegrated alumina suitable for use in producing Al by electrolysis in a fused cryolite bath is obtained by disintegrating fused alumina and rapidly cooling the disintegrated material by water or other liquid. An app. is described.

Alumina. J. C. SEAILLES. Brit. 283,509, Jan. 11, 1927. A hydrated alk. earth. aluminate is prepd. as described in Brit. 277,697 (*C. A.* **22**, 2142) by treating a mixt. of Al ore and an alk. earth base with water under normal or increased pressure, but using 4 mols. of the base to 1 mol. of alumina, and preferably with 2–3 mols. addnl. base for each mol. of silica in the ore. The mixt. is preferably treated in a colloid mill in an autoclave under pressure. By suitable further addn. of a base such as lime and prolonging the treatment more silica is withdrawn as insol. Ca silicate and aluminosilicate. Ca aluminate formed is washed and treated with NaOH and preferably also with CO_2 to form Na aluminate and $CaCO_3$, and alumina is pptd. from the Na aluminate soln. by adding cryst. alumina.

Manufacture of alumina. AKTIESELSKAPET NORSK ALUMINIUM COMPANY. Norw. 44,305, Aug. 15, 1927. Alumina with a low content of SiO_2 is extd. from aluminous [illegible] and similar materials by treating with a soln. contg. approx. 80 g. per l. of

alk. Na compds. calcd. as Na_2CO_3, about 10% of which is present in the form of free NaOH. Some Na aluminate may also be present in the soln. Cf. *C. A.* **21,** 2362.

Aluminum chloride. RICHARD J. DEARBORN (to The Texts Co.). Can. 283,609, Sept. 25, 1928. $AlCl_3$ is made by continuously and simultaneously coking and purifying a mixt. of Al ore and carbonaceous material by heating and chlorinating at a relatively low temp. under conditions that no substantial chlorination of Al occurs, and then without loss of heat chlorinating the purified coked mixt. at a relatively high temp.

Nickel and cobalt carbonyls. LEO SCHLECHT and EMIL KEUNECKE (to I. G. Farbenind. A.-G.). Can. 283,414, Sept. 18, 1928. Co and Ni carbonyls are produced by roasting Co speiss with air and steam and treating with H at 400°, then leaching the product with $(NH_4)_2CO_3$ soln. satd. with gaseous NH_3, expelling the NH_3 by heating, and pptg. the metals in the form of their hydroxides and basic carbonates by diln., thereupon reducing the product with dry H at 350°, and treating the metal thus obtained with CO at 150° under a pressure of 200 atm.

Green hydrated chromium oxide. KURT H. MEYER and HANS KRZIKALLA (to I. G. Farbenind. A.-G.). Can. 283,413, Sept. 18, 1928. Green hydrated Cr_2O_3 is produced by treating a soln. of a compd. of sexivalent Cr at a temp. above 200° and at a pressure above atm. but below 150 atm. with a reducing agent other than H_2SO_3.

Lead oxides. J. J. TARDAN (to Consortium Electro-Chimique de France). Brit. 283,898, Jan. 19, 1927 A paste of spongy finely divided Pb as obtained by electrolysis is slowly dried at a temp. which is progressively raised to about 200° previous to being roasted to obtain Pb_3O_4. A mixt. of PbO and PbO_2 is obtained by the drying operation and it is stated that by suitable control of the conditions of roasting PbO or Pb_3O_4 may be obtained. An app. is described.

Production of nitrogen oxides with simultaneous oxidation of phosphorus. NORSK. HYDRO-ELEKTRISK KVAELSTOFAKTIESELSKAB. Norw. 44,444, Oct. 10, 1927. P is burned in air or mixts. of O_2 and N_2 under such conditions that N oxides are formed. The resulting gases are passed through hot H_2O or H_3PO_4 to absorb the P_2O_5 formed after which the N oxides are absorbed in known ways. The oxidation of the P may be carried out in elec. arc furnaces, the intention being to utilize the increased temp. obtained by the oxidation of P for improving the yield of the N fixation process. The process may be carried out under pressure.

Hydrogen peroxide. I. G. FARBENIND. A.-G. (Carl Miller and Leo Schlecht, inventors). Ger. 464,288 August 2, 1928. A large gas space is used in the prepn. of H_2O_2 by electrolytic reduction of oxygen, to avoid danger in explosions.

Hydrogen peroxide. HERMANN SCHULZE. Ger. 464,353, Aug. 1, 1928. Ba, Ca or Sr hydroperoxide obtained electrolytically is treated, with stirring and cooling below 0°, with HCl and H_2SO_4, or with CO_2 and finally with H_2SO_4, or periodically or continuously with concd. H_2SO_4. The soln. obtained is evapd. on a surface evaporator at ordinary or reduced pressure.

Active carbon. E. BERL. Brit. 283,968, Jan. 21, 1927. Active C is obtained from water-sol. and other acid esters such as those resulting from the purification of petroleum and coal-tar products with H_2SO_4. The esters are neutralized with alk. substances such as KOH, K_2CO_3 or K sulfide and evapd. to dryness, heated to 300–400° to remove S and S compds. and neutral oils, and then heated to a higher temp. with activating gases or vapors and cooled in an inert gas or by quenching with water.

Active carbon. I. G. FARBENIND. A.-G. (Fritz Winkler, inventor). Ger. 463,772. July 19, 1928. Active C is prepd. by action of hot gases on carbonaceous materials in a blast furnace.

Active carbon. SOC. DE RECHERCHES ET D'EXPLOITATIONS PETROLIFERES. Brit. 283,573, Jan. 14, 1927. Before or at the time of activation of C by gases at high temp., the C is impregnated with 1–5% of acids, bases or salts such as H_3PO_4, alkali phosphates, H_3BO_3, a borate, carbonate, bisulfate or silicate of Na or NaOH, which may modify the heat-resisting properties of the material or serve as fireproofing agents. The material may be agglomerated or molded with various specified binders. A light, black and soft decolorizing C may be obtained by impregnating wood charcoal with small quantities of $FeCl_3$, $ZnCl_2$ or HCl, or by washing with acid to remove ash, and then activating. The ash may be washed out of the various products before or after activation, by use of water and acid, or may be volatilized at high temps. after activation.

Activated carbon. I. G. FARBENIND. A.-G. Brit. 283,485, Jan. 10, 1927. In activating C, the material is treated in a thin layer (suitably 5 cm. deep) on a stationary or moving support with an activating gas or vapor which may be passed over the layer or supplied through a diaphragm. An annular kiln with a rotating ring may be employed for carrying out the process in a continuous manner.

Pure carbon. DANIEL GARDNER. Can. 282,782, Aug. 28, 1928. Fine charcoal powder is treated with concd. HNO_3 in presence of H_2SO_4 and subsequently washed repeatedly with H_2O. It is then subjected to further acid treatment with a mixt. of concd. HNO_3 and concd. HCl at about 75° to 80°, the operation being accompanied by continuous stirring. The resulting soln. is decanted and the product thoroughly washed. It is then treated with concd. alk. soln. (as 6 *N* NaOH) and afterwards well washed. The very pure carbon obtained is now heat-treated at 1000°–1300° in a neutral atm., under vacuum, or in a reducing atm. or a gas free from O, to obtain the velvet black tint characteristic of "carbon black."

Hydrogen. JULIEN BELLAY. Can. 282,952, Sept. 4, 1928. Water gas is produced by gasification of coke, lignite, turf and other fuel rich in C without admission of outer air, within a generator heated from the outside, into which superheated steam is blown. The gas produced is enriched in H by causing it to flow through a column forming an extension of the lower generator with adjustable heating and having partitions of fire-proof clay and coal and blowing into the column superheated steam at 100° to 400°. The enriched gas is brought into a known purifier and condenser contg. lime milk in which the CO_2 and coal dust and impurities are sepd., the remaining gases being brought to a purifier heated from outside and filled with a fresh prepn. of soda-lime and completely retaining all the CO and CO_2 still remaining in the H. The pure H is passed to a gasometer.

Removal of phosphorus from gas mixtures. W. REICHENBURG. Ger. 464,351, Aug. 2, 1928. P is removed from gases by silica gel with or without the addn. of oxides or salts of Fe, Ni, Co, Cr, Mn, V, Mo, or Ce. The SiO_2 gel may be partially or wholly replaced by gels of the oxides of Al, Fe, Zr, Sn, or Ti, with or without the above additional substances.

Sulfur. JAMES W. SCHWAB (to Texas Gulf Sulphur Co.). U. S. 1,683,731, Sept. 11. The color of abnormally colored sulfur is improved by treating it while molten with finely divided activated C and then sepg. the materials, *e. g.*, by settling or centrifuging. Cf. *C. A.* **22**, 1019.

Continuous precipitation of sulfur from solutions. I. G. FARBENIND. A.-G. Ger. 463,138, July 5, 1928. Addn. to Ger. 462,092. Solutions of S in low-boiling solvents such as CS_2, obtained from gas purifiers and contg. tar are added to a solvent which is held at a temp. above the b. p. of the low-boiling solvent but below 120°. Tetralin and $C_2H_2Cl_4$ are suitable.

Green corundum. ANTON KRATKY. Austrian 108,704, Sept. 15, 1927. Green corundum (oriental emerald) is obtained by fusing pure Al_2O_3 with a trace of a mixt. of CoO and ZnO, preferably with the addn. of a flux, at a temp. sufficiently low to avoid volatilization of the coloring addn.

Condensation products of aniline with formaldehyde, etc. SOC. ANON POUR L'IND. CHIM. À BÂLE. Brit. 283,965, Jan. 21, 1927. Porous masses of condensation products are densified by use of heat and pressure, *e. g.*, by subjecting to 100 atm. pressure at 150° for about 1 hr.

Phenol-formaldehyde condensation products. GRIGORI S. PETROV and PETER SHESTAKOV. U. S. 1,684,142, Sept. 11. Prepn. of condensation products such as those from cresylic acid or "com. carbolic acid" and CH_2O is effected in the presence of powd. metals, *e. g.*, Pb or Zn, which serve as catalysts.

Artificial horn articles. ADALBERT ZSIGMONDY. Can. 283,383, Sept. 18, 1928. Molded articles from artificial horn (particularly gluten horn substitute from casein and the like) is produced by cutting up pieces from unhardened artificial horn, hardening said pieces, distributing said pieces in a plurality of molds, compressing said molds, at a pressure of about 400 to 500 atm. and temp. of 90° to 100°, and cooling the heated finished pieces.

Cleaning composition. I. B. MÖLLER. Norw. 43,782, March 7, 1927. A mixt. of 55% of sawdust, 5% casein, 10% sodium soap and 30% kieselguhr.

Cleaning and polishing compound. WILLIAM RICHTER. Can. 282,819, Aug. 28, 1928. A cleaning and polishing compd. contains distd. water 57 1/4 oz., light separator oil 18 3/4 oz., turpentine 18 3/4 oz., white wine vinegar 18 3/4 oz., butter of antimony 4 oz., and amberglaze 10 3/4 oz.

Cleaning and polishing compound. CHARLES H. MCALEER, Can. 282,808, Aug. 28, 1928. A cleaning and polishing compd. contains a powdered abrasive, stearic acid, Japan wax, kerosene and a light rubbing oil practically free from paraffin. Cf. *C. A.* 22, 1447.

Polishing composition. THORVALD AASERUD. Norw. 44,660, Nov. 28, 1927. One l. of benzine, 0.3 kg. zinc white and 0.05 kg. lampblack are mixed carefully.

Detergent compositions. KARL TUCEK. Austrian 108,687, Sept. 15, 1927. Detergent compns. (for metal, glass, wool, etc.), comprising a suspension of $CaCO_3$ in EtOH or an alc. soln., are improved by addn. of camphor, suitably in amts. of 1 to 10%.

Manufacture of urea and products containing urea in connection with the manufacture of alumina. E. JOHNSON. Norw. 44,060, Dec. 27, 1927. The mass obtained by decompn. of materials contg. Al_2O_3 with acids is treated with a soln. of cyanamide. The cyanamide will be hydrolyzed to urea at the same time as the Al salts are obtained in the soln.

Impregnating and adhesive compositions. WILHELM PUNGS (to I. G. Farbenind. A.-G.). Can. 282,877, Aug. 28, 1928. Stearin pitch 130 parts, 20 parts of wood oil, 50 parts of whale oil and 45 parts of S are heated at 160° and stirred until a viscous mass, which becomes dry when cold, is formed. To this is added 60 parts of tar ext. obtained by treating brown coal tar with 90% alc., and the fluid product is heated until the desired degree of viscosity is attained. The product is of great value for the impregnation of textile materials, papers, pasteboard or in the manuf. of cables or insulating masses.

Gel formation. JAMES W. MCBAIN (to Grinnell Jones to S. Sternau and Co., Inc.). Can. 283,095, Sept. 4, 1928. A dispersed substance, *e. g.*, nitrocellulose is dissolved in anhyd. EtOH at sub-zero temp. Gellation is caused by increasing the temp. to about normal atm. temp.

Increasing the adsorptive powers of silica gel. I. G. FARBENIND. A.-G. Ger. 463,227, July 5, 1928 (Hans Carstens and Gerhard Kröner, inventors). Acid-pptd. silicic acid gels are washed with alk. solutions, *e. g.*, of Na_2CO_3, NaOH, NH_3, water glass, org. bases, etc.

Roasting kieselguhr containing organic material in mechanical roasting ovens. RICHARD KOECH. Ger. 462,992, June 28, 1928. Mechanical details of the process.

Heat-generating compound. JOHN R. DULANY (to The Chamberlain Co.). Can. 283,402, Sept. 18, 1928. A heat-generating compd. is composed of dry caustic alkali, Al, Al_2O_3, SiO_2 and other impurities contained in Al dross.

Preheating catalyst furnaces. GEORG F. UHDE. Can. 283,220, Sept. 11, 1928. Catalyst furnaces and the catalyst bodies therein for the purpose of effecting the synthesis of NH_3 are preheated by heating the mixt. of gas under pressure before it enters the reaction furnace (by an outer source of heat) to a moderately high temp. and the heat accumulated therein is afterwards communicated to the said reaction furnace and the catalyst bodies.

Coloring granular slate. HARRY C. FISHER (to The Richardson Co.). Can. 283,295, Sept. 11, 1928. Granular slate is colored by immersing it in a bath of dissolved hydrated sulfate of a desired metal (Cu), then boiling to or near dryness, then firing to convert the sulfate to an oxide of the metal, then immersing the slate in a bath of hydrated $FeSO_4$, boiling to or near dryness, and firing a second time to convert the $FeSO_4$ to oxide and form ferrites of the metal oxide, the color varying upon the excess of either oxide. Cf. *C. A.* **22**, 3747.

Coloring granular slate. HARRY C. FISHER (to The Richardson Co.). Can. 283,296, Sept. 11, 1928. Slate granules are colored by intimately mixing with an Fe salt and a Cr salt and roasting so that the Fe will pass through a hydroxide state, and then further roasting the granules to change the Fe into an oxide state.

Coloring granular slate. HARRY C. FISHER (to The Richardson Co.). Can. 283,297, Sept. 11, 1928. Granular slate is colored by mixing it with a pigment material and sol. silicate, and rapidly roasting the granules to bring about a puffy opaqueness of the siliceous mixt. and subsequently heating the granules to change the physical characteristics of the puffy opaque siliceous mixt., the heating being accompanied with agitation.

Asbestos paper. WILLIAM NANFELDT (to World Bestos Corp.). Can. 283,449, Sept. 18, 1928. Asbestos paper adapted for use in yarn manuf. is made by forming a pulp of asbestos, treating rosin to render it miscible with water and to form a binder which will substantially retain its strength when the resulting paper is wet, incorporating the binder thus formed with the pulp, and forming asbestos paper from said pulp and binder.

Match splints formed of paper pulp reinforced by metal wire. GEORGE A. TAYLOR. U. S. 1,684,000, Sept. 11.

Transferring pictures from paper to celluloid. C. GLASER. Brit. 283,571, Jan. 14, 1927. Transfer is effected by use of solvents, etc., so as to produce pictures held between sheets of celluloid and which have somewhat the appearance of oil or water color paintings.

Masking composition. William A. Brewer and P. Dean Jackson. Can. 283,454, Sept. 25, 1928. A masking compn. to protect a portion of a surface to be coated comprises a mixt. of glycerol 16 parts, whiting 32 parts and water 1 part, with a small addition of an essential oil and a coloring matter.

Button board. Albert L. Clapp (to Beckwith Mfg. Co.). U. S. 1,683,605, Sept. 11. A material suitable for making buttons, sound records, etc., is made by disintegrating and beating waste paper, wood pulp or other suitable cellulosic material in water, together with a mech. comminuted resinous gum such as rosin, shellac, copal or sandarac and a suspension medium such as starch and lime and forming the resulting pulp into shape, *e. g.*, by heat and pressure.

Paint remover. Fred C. Dean. Can. 283,159, Sept. 11, 1928. A compn. for removing paint and varnish contains a pure benzene spirit, crude benzene or coal tar naphtha, paraffin wax, ceresin wax, and methylated spirit.

Amalgams for filling teeth. E. W. Fischer and E. W. J. Virgin. Brit. 283,488, Jan. 10, 1927. Particles of alloying metals such as Sn or Ag and Sn are given a preliminary coating of Hg to assist in amalgamation with addnl. Hg added by the dentist. A hot soln. of $HgCl_2$ and dil. HCl may be used for the preliminary coating.

19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON, C. H. KERR

Report of the Glass Workers' Cataract Committee. J. R. Bradford, *et al.* *Proc. Roy. Soc.* (London) **B103**, 192–207(1928).—Glass workers' cataract is not due to the action of luminous radiation or x-rays, and probably is not due to the direct action of ultra-violet or infra-red rays. It may be due to an indirect action on the nutrition of the lens, caused by the deleterious action of the infra-red rays on the iris and ciliary body. Cataract, indistinguishable from glass workers' cataract, occurs in tin plate rollermen, chain makers, and puddlers. Joseph S. Hepburn

Renaissance glass. Walter Butterworth, Sr. *J. Soc. Glass Tech.* **12**, 119–28 (1928); cf. *C. A.* **22**, 2646.—An illustrated discussion of the development of stained glass art. H. F. K.

Some recent improvements in the manufacture of flat glass. H. K. Hitchcock. *Glass Ind.* **9**, 105–9(1928); cf. *C. A.* **22**, 2249. H. F. K.

Breaking strength of glasses as a function of the composition. Oscar Knapp. *Glass Ind.* **9**, 78–80; *Glass Industrie* **35**, 245–7(1928).—Special glasses for chem. ware gave values in thermal and mech. shock tests quite in agreement with Winkelmann's formula: $W = P/aE \sqrt{k/S\,c}$, where W = thermal strength, P = tensile strength, a = expansion, E = elasticity, k = thermal cond., S = sp. gr., and c = sp. heat. H. F. K.

Use of barite in soda lime flint glasses. D. J. McSwiney. *Glass Ind.* **9**, 97–9 (1928).—Barite appears to serve well in facilitating melting and refining of the batch—improving the annealing properties, the brilliancy and weathering resistance of the glass. Some 500 tons per month are used in this country. H. F. K.

Experiments on the acceleration of glass melting by the use of volatile constituents in the batch mixture. W. E. S. Turner. *J. Soc. Glass Tech.* **12**, 134–8(1928).—The addn. to the batch of NH_4Cl, NH_4NO_3 and $(NH_4)_2SO_4$ in amts. up to 1% of the sand wt. increased the melting rate. The NH_4Cl and $(NH_4)_2SO_4$ also increased the refining rate, especially in pot furnaces. $(NH_4)_2SO_4$ proved best in these respects and did not produce color defect or seediness. H. F. K.

Some notes on accelerating the melting of glass. R. Hemingway. *J. Soc. Glass Tech.* **12**, 131–4(1928).—In parallel tanks, one producing colorless glass, the other amber it was noted that the melting rate of the amber glass was greater by 50%. The only difference in the 2 batches was the S in the amber glass. Conclusion: The stirring action produced by the gaseous compds. of S during the heating increased greatly the melting rate of the batch. H. F. K.

Density control of glass tanks. A. R. Payne. *Glass Ind.* **9**, 121–5(1928).—A density change indicates a change in compn. of the batch. As a control method it can be used to supplement chem. analysis. H. F. K.

Some remarks on glass-house pots. Percival Marson. *J. Soc. Glass Tech.* **12**, 141–6(1928). H. F. K.

Designing glass-forming molds. Roy E. Swain. *Glass Ind.* **9,** 148–51(1928). H. F. K.

Electrolytic chromium plating of glass molds and cylinder materials. Kurt Illig. *Glastech. Ber.* **5,** No. 6(1927); *Glass Ind.* **9,** 31–5(1928).—The factors encouraging the Cr plating of molds, etc. are added permanence of the molds without loss in definition and detail, or need of changed design, and at relatively low cost. H. F. K.

Aspects of bottle machine operations. B. M. Pearson. *Glass Ind.* **9,** 143–8 (1928). H. F. K.

Control and distribution of temperature in lehrs. A. Cousen, H. W. Howes and F. Winks. *J. Soc. Glass Tech.* **12,** 146–58(1928).—To det. satisfactorily the heat distribution within lehrs a pyrometer was devised which could travel down the lehr on the belt beyond the crit. zone. Couples of eureka-stainless iron and nichrome–Kromore were found suitable. Graphs of the temps. found in several types of lehrs are given. H. F. K.

Unique lehr. Arron. *Glass Ind.* **9,** 99–103(1928).—Illustrated discussion of the Dixon fuelless lehr which anneals with the heat of the ware. H. F. K.

Design and operation of glass furnaces. W. W. Warren. *J. Soc. Glass Tech.* **12,** 128–31(1928).—Discussion of the radiation and other heat losses, and some factors affecting the output of furnaces. H. F. K.

Apparatus for recording the glass level in a tank furnace. J. W. Ball and C. G. Eden. *J. Soc. Glass Tech.* **12,** 138–40(1928).—The app. is described in a detailed drawing. It consists of a siphon with a float moving an arm vertically which in turn operates indirectly a needle on a continuous recording graph. H. F. K.

Design of plate glass polishing machines. F. W. Preston. *Glass Ind.* **9,** 27–9, 57–9, 81–4(1928).—The glass removed during polishing is a measure of the work done on it. The arrangements of the felts of the polisher must avoid localized over heating and cut away the glass as uniformly as possible. Patterns of the felts and the profile of their cuts are shown. H. F. K.

Study of the casing of clear opal glass. The importance of annealing. Francis Winks and W. E. S. Turner. *J. Soc. Glass Tech.* **12,** 161–4(1928).—It was possible to unite 2 com. glasses, one clear and the other opal, by slow annealing at just below the upper annealing temp. of the clear glass even though this temp. was 53° lower than the upper annealing temp. of the opal glass. H. F. K.

Some conclusions which can be drawn from the measurement of the expansion of glasses by means of the Chèvenard dilatometer. Emilio Damour and G. Thuret. *Chimie et industrie* Special No., 436–8(April, 1928).—See *C. A.* **22,** 671. A. P.-C.

A new washing process [for clays]. V. Busch. *Tonind. Ztg.* **52,** 1527–8(1928).—The customary method of washing clays requires too much space. An equipment which is capable of doing the same work is described. The clay is first blunged with water and the suspension thus formed is passed through a series of tanks similar to elutriators. H. G. Schurecht

Controlling the sand contents of clays and bodies by means of data obtained with elutriation tests. H. Harkort. *Ber. deut. keram. Ges.* **9,** 189–202(1928).—H. classifies the SiO_2 into coarse, medium, and fine sand and with the aid of elutriation tests keeps the fineness as well as the percent SiO_2 fairly const. in ceramic bodies. H. G. S.

Investigations of sagger clays. H. Kohle. *Ber. deut. keram. Ges.* **9,** 57–69(1928).—Saggers made with a washed kaolin and fine grog lasted about 25% longer than those made of sandy fire clay and grog. H. G. Schurecht

The use of Wildstein-Neudorfer sagger clay, brand "M," as raw material for the manufacture of saggers. R. Rieke. *Sprechsaal* **61,** 159–60(1928).—Chemical analysis: SiO_2, 50.85%; Al_2O_3, 43.03%; Fe_2O_3, 1.30%; TiO_2, 1.17%; CaO, 0.22%; MgO, 0.10%; alkalies K_2O, 2.48%; ignition loss, 10.40%. Coeff. of expansion: Between 20° and 300°, 20 × 10^{-7}; 300° and 500°, 40 × 10^{-7}; 500° and 600°, 35 × 10^{-7}; 600° and 800°, 27 × 10^{-7}. Rational analysis is given as 88.16% clay substance; 6.7% free quartz and 5.14% feldspar. Softening temp. is Seger cone 34–35. The material is very fine grained, 96% passing a sieve having 10,000 openings per sq. cm. After burning at cone 010a the porosity is 38.1%; at cone 15, 5.9%. R. A. Heindl

Plasticity of clays. A. Simon and W. Vetter. *Ber. deut. keram. Ges.* **9,** 216–28 (1928).—The capillary properties of clay are studied by means of vapor-pressure measurement of the clays with different water contents. Clays having the finest capillary pores have the lowest vapor pressures. H. G. Schurecht

Observations on the causes of the plastic conditions of clay. Herman Salmang. Tech. Hochschule, Aachen. *Sprechsaal* **61,** 115–6(1928); cf. *C. A.* **22,** 1222.—A re-

view of the various theories with especial reference to surface tension and adhesion and the plasticity of other masses that do not contain clay. R. A. HEINDL

Firing of clays in presence of water vapor and sulfur dioxide. J. KONARZEWSKI AND B. KRYNSKI. Polytech., Warsaw. *Przemysl Chem.* **12**, 176–84(1928).—The effect of water vapor and SO_2 on the progress of dehydration of china clay was studied. Up to 550° water vapor retarded dehydration, but above 550° it has practically no effect. SO_2 did not influence dehydration. Al_2O_3 and Fe_2O_3 in this clay fired at 550–800° could be dissolved by heating with HCl. Clays fired in the presence of SO_2 combine small quantities of it. The sulfates of Ca, Mg, Al and Fe are formed. The combined S can be removed completely by firing the clay in an oxidizing atm. A. C. Z.

Factors governing the durability of clay building materials. W. ANGUS MCINTYRE. Building Research Sta. *Brit. Clayworker* **37**, 195–205(1928).—Texture is important but the main factor is the crystn. of sol. salts, mainly sulfates. The expansion resulting from hydration of some of the salts produced is partly responsible for disintegration. Frequent washing tends to prevent the action. R. A. HEINDL

Science in the brick industry. R. RIEKE. *Tonind. Ztg.* **52**, 1459–61(1928).—More scientific aid is required to solve the problem relative to drying and firing of brick. H. G. SCHURECHT

Mineral constituents and origin of a certain kaolin deposit near Spokane, Washington. G. A. GOODSPEED AND A. A. WEYMOUTH. *J. Am. Ceram. Soc.* **11**, 687–95 (1928).—The kaolin occurs in unusual dikes. The evidence points to endomorphic action or perhaps even direct primary origin. C. H. KERR

Progress in refractory materials. C. J. VAN NIEUWENBURG. *Intern. Congress Testing Materials* **1927**, II, 359–64. E. H.

Practical experience of firing refractory materials with oil. FRANK WEST. *Trans. Ceram. Soc.* (England) **27**, 104–21(1928). H. F. K.

Physico-chemical principles of grinding materials. WILHELM EITEL. *Z. Ver. deut. Ing.* **72**, 1155–7(1928).—Not only hardness, but cleavage, tensile strength, brittleness, structure and other properties must be considered in detg. the value of grinding materials. The crystn. of a material from its molten state must be controlled carefully so as to produce the form of abrasive desired; this necessitates the use of correct phase diagrams. The binding materials used are of great importance also. Although artificial diamonds have not been prepd. on a large scale this is no proof that they may not be available in the future, for other problems seemingly as difficult have been solved. The influence of SiO_2, MgO, CaO, etc. on the compn. and properties of the crystals or mixed crystals produced in making alundum and other forms of Al_2O_3 is shown by diagrams and photomicrographs. In SiC the form of the crystal lattice is important in fixing the properties of the abrasive. Although the materials known to make good abrasives are few in number new substances showing promise of usefulness include certain Al silicates, W carbides, etc. W. C. EBAUGH

Structural research on hard porcelain. O. KRAUSE. Porzellanfabrik. Kahla, Freiberg, Saxony. *Z. tech. Physik* **9**, 247–63(1928).—For the manuf. of hard porcelain are used: I "clay" substance (or kaolinite) $Al_2O_3.2SiO_2.2H_2O$, which is plastic and loses H_2O and decomposes from 300° up, forming more HCl-sol. Al_2O_3. At 800° this decompn. is finished. At 1200° and above a new compd. seems to be formed. A time heating curve shows at 570° an endothermic, at 950° an exothermic, effect. II quartz, with the α-β (575°) transformation and those of tridymite and cristaobalite, III feldspar, consisting mostly of orthoclase and a little albite, the former m. 1200° and partly transforming into cryst. leucite m. 1100°. From these data the characteristics of the porcelain (av. 50% I, 25% II, 25% III) can be derived. The end product is in the heterogeneous system Al_2O_3–SiO_2–K_2O (or Na_2O). Complete bonding of Al_2O_3 and K_2O can be assumed with up to 20% free SiO_2. Heterogeneous equil. is only partly reached. The compn. attained is probably parallel to the Al_2O_3–SiO_2 side of the triangular diagram and the substance will have a fusing curve similar to that of Al_2O_3–SiO_2, allowing for a depressing influence of the alkali. It is therefore to be expected that ideal porcelain is a glassy mass with crystallites of mullite ($3\,Al_2O_3.2SiO_2$) and tridymite. These views were tested by x-ray work. Samples, finely pulverized, were illuminated with $CuK\alpha$ light (4 to 5 hrs.), the results being calcd. by Braggs relation. Expts. on kaolin (SiO_2 45.34%, Al_2O_3 37.93%, ignition loss at 1000° 13.92%) showed that this substance dried at 200° gives a diagram identical with that of natural nakrite (Freiberg); on heating at higher temps. more and more lines disappear. At 600° the original lattice is practically gone (no macroscopic change), leaving only a few of the strongest lines (amorphous). A second change appears at 1000°, showing recryst. and mullite formation, proportional to the kaolinite content. To confirm this point (Bowen and Greig),

disputed by Rosbaud (*C. A.* **20**, 3105.), the crystal needles from a kaolin melt were compared with natural (Delaware Co., Pa.) sillimanite ($Al_2O_3.SiO_2$). The similarity is incomplete; the reflection angles φ of "mullite" are on the av. 0.15° smaller than those of sillimanite (more than the limit of error) and always equal to those found for the needles in porcelain (one exception, unexplained, of sillimanite needles was found in an a. c. spark plug porcelain). Conclusion: The crystals formed on burning of ceramic masses are silicates with a lattice distorted (widened) by added Al_2O_3; it may be called mullite. X-ray pictures of burned porcelain (German and American) showed mullite to be present in all to a greater extent than previously assumed. Three groups of porcelain are distinguished: (1) poor in mullite; rich in quartz; (2) av. in both; (3) rich in mullite, poor in quartz. The mechanically strong porcelains (motor insulators, power line insulators) seem to belong to group 1. The second group is of av. quality; the 3rd group is that of the farthest advanced equil. (Staatliche Porzellan Manufaktur) and shows the best resistance against temp. changes. The Gilchrest and Klinefelter criteria for elec., thermal and mech. resistance as related to compn. (*Electric J.* **1918**, 36, 77) were confirmed. Diagrams are shown of porcelain mass burned to various temps. from 625° to 1410° in which the gradual disappearance of feldspar and quartz, and the appearance of tridymite and mullite can be traced. Rieke's work on this subject (*C. A.* **21**, 997) is discussed. For the formation of the mullite crystals it is assumed that submicroscopic crystals are formed below the formation point of the liquid phase. On further heating they partly dissolve in the latter and later on sep. out after satn. of the melt with SiO_2. B. J. C. VAN DER HOEVEN

Annealing of glazes. W. STEGER. *Ber. deut. keram. Ges.* **9**, 203–16(1928).—S. measures the annealing temp. of glazes by heating glazed bars in an elec. furnace and noting the deflections of the bars. When the bar is first heated it bends as a result of strains between the glaze and body. When it is heated to the annealing temp. of the glaze the bar ceases to bend because the glaze now is viscous and therefore no longer exerts strains between it and the body. H. G. SCHURECHT

Danger to health of antimonial enamels. B. REWALD. *Z. angew. Chem.* **41**, 287–8 (1928).—A criticism of the conclusions of Flury (*C. A.* **22**, 1622). Stress is laid on the innocuous character of Na metantimonate and compds. of quinquevalent Sb generally. In a rejoinder Flury points out that compds. of quinquevalent Sb may be reduced in the actual process of manuf. of the enamel, and that enamels made from such compounds have in fact been shown to yield salts of tervalent Sb, when subjected to acid solns. B. C. A.

Technology and uses of Se (KRAK) **18**. Researches on silicates (CHERBULIEZ, ROSENBERG) **6**. The natural resources of Wales [clays] (NORTH) **8**. Strains and their removal by breaking and gliding (RINNE) **2**. Influence of pressure in the low-temperature inversion of quartz (GIBSON) **2**. Thermoelectric measurement of temperatures above 1500° (WATSON, ABRAMS) **2**. Plasticity. IV. Plastic materials from SiO_2 (RUFF, HIRSCH) **2**. A note on the low-temperature inversion of quartz and the heat capacity of low quartz at 573° (GIBSON) **2**. Rotary kiln for drying clay (Brit. pat. 283,669) **1**. Use of natural olivine rock for furnaces or other apparatus exposed to high temperatures or to chemical action (Brit. pat. 283,791) **1**.

Glass. MAX THOMAS (to Patent-Treuhand-Gesellschaft für elektrische Glühlampen m.b.H.). U. S. 1,684,332, Sept. 11. See Brit. 256,189 (*C. A.* **21**, 2946).

Electric glass furnace. BJÖRN RAEDER. Norw. 44,661, Nov. 28, 1927. Mech. features of design and operation.

Apparatus for conveying the fused glass mass from the melting furnace to the molding machine. AKTIESELSKAPET MOSS GLASVAERK. Norw. 44,612, Nov. 14, 1927.

Conveying the glass from the smelting furnace to the molding machine. AKTIESELSKAPET MOSS GLASVAERK. Norw. 44,075 and 44,076, May 30, 1927. Mech. features.

Apparatus for distributing melted glass mass into molding charges of desired sizes. AKTIESELSKAPET MOSS GLASVAERK. Norw. 44,788, Jan. 23, 1928.

Mold for glass articles. FRANK M. BIGELOW. U. S. 1,683,755, Sept. 11. Structural features.

Hand-operated apparatus for blowing glass articles. SOC. ANON DES PAVILLONS. Brit. 283,870, Jan. 18, 1927. Structural features.

Glass leer of the muffle type with an endless conveyor for carrying articles through it. WILLIAM A. MORTON (to Amsler-Morton Co.). U. S. 1,684,239, Sept. 11.

Apparatus for forming and annealing sheets of glass. HERMAN S. HEICHERT (to Pittsburgh Plate Glass Co.). U. S. 1,683,973, Sept. 11.

Rolling and annealing plate glass. GEORGE E. HOWARD (to Hartford-Empire Co.). U. S. 1,684,030, Sept. 11. Mech. features.

Polishing glass sheets. GEORGE E. HOWARD (to Hartford-Empire Co.). U. S. 1,684,029, Sept. 11. Mech. features.

Porous clay. EMRICK I. LINDMAN (to The Aerocrete Corp. of Can.) Can. 283,231, Sept. 11, 1928. Clay, preferably quarternary clay, is heated at continually increasing temp. first rather quickly to a temp. near the melting pt. (1000 to 1050°), and then cautiously to such a temp. that the material assumes a viscous consistency to facilitate the expansion of the material by the enclosed gases and form a porous product, whereupon the heating is stopped.

Abrasive paper or cloth. RALPH B. MANLEY (to The Carborundum Co.). U. S. 1,683,623, Sept. 11. A backing such as paper or cloth carries aluminous abrasive grains uniformly distributed and individually spaced on its surface so as to avoid grain clusters and to provide uncovered portions of the backing sufficient in size to prevent permanent lodgment in them of material which has been ground away.

Enameling composition. MAHLON E. MANSON (to Rundle Manufacturing Co.). Can. 282,726, Aug. 21, 1928. An enameling compn. contains 68 parts Na silicate contg. 23% soda and 74% silica, 5 parts $Al(OH)_3$, 13 parts borax, 18 parts sodium antimonate, 6 parts cryolite and 8 parts $BaCO_3$.

20—CEMENT AND OTHER BUILDING MATERIALS

J. C. WITT

New cement-burning process. KARL BIEHL. *Pit and Quarry* **16**, No. 12, 72–5 (1928).—See *C. A.* **22**, 3029. E. H.

Progress in making lime and cement and their effect on masonry. J. BOLOMEY. Univ. Lausanne. *Ciment* **33**, 323–8(1928).—An address. F. O. A.

The decree of December 24, 1927, establishing the specifications for hydraulic cements for public work in France. ANON. *Rev. materiaux construction trav. publics* 1928, 312–6. F. O. ANDEREGG

Metallurgical slags and cements. ANON. *Rev. materiaux construction trav. publics* 1928, 250–4.—At Abrebach in the Sarre slag is first made into portland cement having the compn.: CaO 67.3, SiO_2 18.9, Al_2O_3 6.6, Fe_2O_3 2.2 and MgO 2.6%. The clinker is then ground with granulated slag to form metallurgical cements which meet the Parisian specifications for strength. The method of manuf. is described. F. O. A.

Effect of curing on apparent free lime in portland cement. ARTHUR J. POOL. *Rock Products* **31**, No. 19, 70(1928).—Detns. of the amt. of free lime by the Lerch & Bogue method were made on several cements immediately after grinding and after 1, 3 and 7 days' storage in the lab. in cloth sacks. The quantity of free lime generally showed an increase followed by a decrease, indicating that $Ca(OH)_2$ liberated from the cement compds. by atm. moisture may become carbonated rather slowly. RAYMOND WILSON

Iron oxide *vs.* alumina as a fluxing agent in the manufacture of portland cement. ALTON J. BLANK. *Rock Products* **31**, No. 14, 68–9; No. 18, 78–9(1928); cf. *C. A.* **22**, 2450.—B. points out better grindability of clinker, less ring formation in kilns, longer life of kiln linings and other advantages of adding Fe ore or high-Fe slags to raw mix. RAYMOND WILSON

A recording apparatus for determining the setting time of cement. L. LIAUTAUD. *Rev. materiaux construction trav. publics* 1928, 256–9.—See *C. A.* **22**, 2253. F. O. A.

The contraction of cements. J. COCAGNE AND Y. MATRAS. *Ciment* **33**, 232–4 (1928); *Science & industrie* **12**, 89–94.—The best results are secured by using as little water in the mix as possible followed by copious wetting after the cement has reached its set, by applying rather lean mixes and probably by using sharp aggregates. F. O. A.

Action of distilled and river water on tensile strength of cement test briquets. ALTON J. BLANK. *Rock Products* **31**, No. 14, 66–7(1928).—B. finds no retrogression in tensile strength when briquets are stored in distd. water, whereas retrogression is common when a calcareous river water is used for storage. RAYMOND WILSON

The red corpuscles in the blood of cement workers. WALTER SALECK. *Arch. Hyg.* **99**, 60–70(1928).—The effect of continued inhalation of cement dust in the cement

factories is to increase greatly the no. of polychromatic erythrocytes. Some of the workers showed fine basophilic granulated erythrocytes, which did not resemble the corresponding erythrocytes found in the blood of lead workers. The cement workers showed considerable resistance to disease; and the respiratory organs were especially resistant. P. Y. JACKSON

Equation for predicting strength of concrete. F. N. WRAY. *Eng. News-Record* **101**, 291–2(1928).—An equation is given by means of which it is possible to predict the strength of concrete at any age between 7 days and 5 years when the strength at any other age between these limits is known. R. E. THOMPSON

The determination of the compressive strength of mortar and concrete. R. DUTRON. *Rev. materiaux construction trav. publics* **1928**, 215–20, 254–6, 293–7.—Various formulas are tried out. F. O. A.

A new mold, and concrete test methods on Port of New York Authority bridges. A. W. MUNSELL. *Eng. News-Record* **101**, 140(1928).—The concrete control methods employed are described briefly. A new mold having many advantages is also described. R. E. THOMPSON

Beam tests of pavement concrete placed by two methods. THOMAS R. BEEMAN. *Eng. News-Record* **101**, 200–2(1928).—Standard concrete of 1:2:3 mix (1.67 barrels of cement per cu. yd.) was compared with a leaner concrete of 1:2:4$^1/_2$ mix (1.30 barrels of cement per cu. yd.) compacted by vibrating machines. The latter differed from "vibrolithic concrete" inasmuch as crushed rock was not forced into it by the vibrating machines. Tests at 28 days (including 10 days' water curing) showed the former to be 15% stronger under tension at the bottom and 12.1% stronger under tension at the top. The modulus of rupture of the standard pavement was 4.6 and 2.6% greater with tension on the bottom and top, resp. The standard specimens showed uniform structure throughout, while the compacted slabs showed excellent structure and density in the top half but poor structure in the lower half. R. E. THOMPSON

Proportioning concrete mixes for the Coolidge Dam. BRUCE JOHNSTON. *Eng. News-Record* **101**, 66–7(1928).—Brief details are given of the proportioning methods employed during the construction of the Coolidge Dam. A series of tests, the results of which are presented graphically, showed a straight-line relation between the mortar strength and the cement content when the consistency was kept const. The water is not measured directly, but the consistency of the mix is rigidly controlled. Segregating the rock into 3 classes has greatly facilitated control of the mix and made possible very consistent and uniform results. The agreement between the 28-day strength of the mortar and the job concrete is striking, being 2900 and 3150 lb. per sq. in., resp., for class A concrete, and 2450 and 2480 lb. per sq. in., resp., for class B concrete. R. E. THOMPSON

Elastic stresses developed in arch dams by varying conditions of temperature and shrinkage of concrete. HAEGELEN. *Annales pont chaussees* Nov.-Dec., 1927; *Ciment* **33**, 198–202. F. O. A.

Permeability of concrete. W. HUGENTOBLER. *Ber. Kommission Abdichtungen Schweiz. Wasserwirtschaftsverbands* **1928**, No. 5, 96; *Beton Eisen* **27**, 261.—The permeability of concrete varies with the amt. of cement and inversely with the amt. of water. Stone dust, hydraulic lime, etc. have little effect, although up to 9% $Ca(OH)_2$ is beneficial. Natural sand and gravel give better results than crushed rock. When specimens are stored damp the permeability is greater than when stored dry, although the former on drying out approach the latter. The penetration of water is faster at the start of the expt. and depends upon the pressure. Specimens stored 53 and 97 days gave similar results. A pitch coating withstood fairly high pressures, while bituminous coatings were sometimes helpful, sometimes not. Surfaces plastered with cement mortar withstood small pressures but not larger ones. A metal coating sprayed by the Schoop process withstood 15 atm. pressure. F. O. ANDEREGG

Deterioration of concrete by corrosive waters. R. GRÜN. *Chem. Fabr.* **1928**, 281–3, 294–5.—The most important damage is caused by H_2SO_4 either combined in sea water or free in natural acid water. Ordinary concrete can be made resistant by producing a dense non-porous aggregate of uniformly sized material. At least 400 kg. of cement per sq. m. must be used. Painting with bitumen is beneficial and better than covering with clinker and cement. Aluminous cement with 7–50% Al_2O_3 is very resistant to $MgSO_4$, but its behavior in presence of Na_2SO_4 is doubtful. The resistance of pozzuolana to corrosion is very great, as is shown by the existence of water mains in good condition today constructed by the Romans of this material. The effect of its addn. to concrete is to increase the d. and to liberate lime, which acts protectively. It can only be used with slow-setting concrete. Cements prepd. from blast-furnace

slag fall into the same class; or a mixt. of blast-furnace slag and portland-cement clinker may be used. Those made from acid slags have not a high initial strength, but if the clinker content is low they are very resistant to salt water. Aluminous slags have the best "hydraulic" qualities of any, but are not so resistant to corrosion as might be expected. Basic and Mg slags also make good cement, but it is not resistant to salt water. Generally speaking, all these cements have less initial strength than portland cement, but greater resistance to corrosion. B. C. A.

Recent developments in wood preservation. ROBERT NOWOTNY. *Oesterr. Chem.-Ztg.* 31, 126–9(1928).—The *Boucherie process* ($CuSO_4$) is still widely used in Switzerland, France, Holland and Sweden. 1927 statistics of the Swiss Telegraph Department show an av. life of 20.1 years for poles. These poles receive rigid inspection and are treated with a $CuSO_4$ soln. of only 0.8% strength. N. ascribes this long life to the favorable Swiss climatic conditions. In France, the dry treated poles are given a butt-treatment with hot creosote as an addnl. protection. Recent experience with pressure treatment in properly protected cylinders has not been entirely satisfactory. *Kyanizing* ($HgCl_2$).—The older open-vat methods gave a penetration of only a few mm., particularly with fir and hemlock poles. Attempts to obtain deeper penetration by means of pressure in protected cylinders has so far failed. By a preliminary treatment with chem. solns. and steam, Kinberg obtains a penetration of 3 to 4 cm. in fir. In the Dia-Kyanizing process of Hugron, the poles are first heated with steam or dry air and then immersed for 3 to 4 days in the $HgCl_2$ soln., a uniform penetration of 3 to 4 cm. resulting. *Fluorides.*—NaF is rarely used alone, but is the main ingredient of a no. of new preservatives. Basilit, NaF + dinitrophenol + aniline (B. MalenKović 1909), was the prototype of the series which, among others, includes Malenit, Triolith, Fluoran. These are combinations of NaF and nitrated phenols or cresols, with the addn. of small quantities of other salts such as chromates to reduce metal corrosion. The NaF in these combinations penetrates deeply into the wood, is not fixed by the wood fiber and is leachable, whereas the dinitro compds. which do not penetrate so deeply are fixed by the wood fiber and are not easily leached out. They also stain the wood an intense yellow. Falck proposes boring holes in timbers 2 cm. in diam., 30–40 cm. apart longitudinally and 4 cm. laterally, filling with dinitrofluoride salts and closing with wooden plugs. The salts will gradually diffuse into the surrounding wood. The *Cobra* process injects dinitrofluorides into wood in the form of a paste by means of a puncturing hammer. Fluosilicate salts are highly toxic and particularly suitable for interior surface treatments. *Arsenic compounds.*—According to R. Falck, As compds. belong to the most toxic group of preservatives, particularly $NaAsO_2$. The latter should not be used in building interiors on account of possible AsH_3 liberation by molds. Compds. of org. color bases with arsenious acid have promising possibilities. Curtin (cf. *C. A.* 22, 857), after demonstrating that the secretions of certain wood-destroying fungi are acid and are capable of dissolving insol. toxic salts, has developed a new preservative, Zn metaarsenite, highly toxic and not leached out by water. Based on the same principle, Malenković had previously proposed a process that forms Zn_2OF_2 in wood by using $ZnCl_2$ and NaF solns. *Oil impregnation.*—The most important oil preservative is still coal-tar creosote. The empty-cell Rueping process is most generally used. With refractory woods like fir and hemlock, mech. perforation or puncturing is resorted to to obtain more satisfactory penetration. What the most desirable constituents of creosote are is still an open question. In recent years the lower-boiling compds. are considered less desirable than formerly, since wood is now treated with a very small final retention of creosote. After the disappearance of the more volatile oils it is a question whether enough creosote remains to preserve the wood. Falck ascribes a higher effectiveness to the higher-boiling compds. Gram proposes the addn. of low-temp. tars rich in paraffin to creosote to retard evapn. and to waterproof the wood. A. Becker proposes a double Rueping treatment, creosote followed by malenit soln. An extensive bibliography is included. ALFRED L. KAMMERER

Wood preservation in Western Australia. C. R. KENT. *Chem. Eng. Mining Rev.* 20, 341–4(1928).—*Powellizing* is the only preservation process used in Western Australia to any extent and it has been used by the railroads in treatment of karri sleepers since 1909. Later As was added to prevent termite attack. The green timber is run into open vats, covered with a water soln. of 11% molasses and 1% As_2O_3 which is heated to near boiling for 8 hrs. The soln. is then allowed to cool 12 to 16 hrs., after which the timber is removed. *Service records.*—In districts of high rainfall and poor drainage, that is where conditions were favorable to decay, the av. life of Powellized karri sleepers was 8 to 10 years, compared with 15 to 20 years for untreated jarrah, whereas in districts having low annual rainfall and conditions unfavorable to decay but

favorable to termite attack, the Powellized karri sleepers gave excellent service. Between these extremes, intermediate results were obtained. In no instance was failure of Powellized karri due to termite attack. The records demonstrate the value of Powellizing in termite-infested districts possessing climatic conditions unfavorable to decay. In view of the above, J. E. Cummins of the Forest Dept. developed the *Fluorizing* process, employing a water soln. of 3.5% NaF, 0.3% Na dinitrophenate and 1.0% As_2O_3, the latter added as an insecticide against termites. Com. treatment began in 1926. The treating operation is the same as that used in Powellizing described above. Green karri gives better penetration than dry and little is gained by pressure. Culture tests with *Trametes lilacinogilva* grown on potato-dextrose-agar indicated the following concns. necessary to kill the fungus: Powellizing soln. 8.0%, $ZnCl_2$ 0.35%, NaF 0.25%, Na dinitrophenol 0.025%, 90 NaF + 10 Na dinitrophenol 0.06%. A. L. K.

Grozny paraffin mazout and creosote oil as wood preserver. A. Voronov. *Neftyanoye Khozyaistvo* **12**, 550–3(1927).—Sludge formed in mixing paraffin mazout with creosote oil retards the mixt. from entering the wood. The most suitable proportion was established as 1:1. The wood must be dry to obtain a complete impregnation. The amt. of sludge formed can be considerably decreased by using a light fraction of creosote oil (below 350°). A good impregnation increases the wt. of wood by 88%. A. A. Boehtlingk

Treated timber still good after 45 years of exposure. W. B. Gregory. Tulane Univ., New Orleans. *Eng. News-Record* **101**, 355–6(1928).—The results are given of strength tests on creosoted southern pine timbers which had been continuously exposed in a sub-tropical climate with an annual rainfall of more than 56 in. The timbers compared favorably with new untreated wood and with recently treated wood of the same general characteristics. Details are given of the specifications under which the creosote treatment was carried out. R. E. Thompson

The rational utilization of coal-tar oils and pitch [on roads] (Trabuc) **21.** Rotary kiln for manufacture of cement (Brit. pat. 283,669) **1.** Protective coatings for wood or stone (Brit. pat 283,664) **9.**

Cement. Karl Biehl (to Wickingsche Portland-Cement- und Wasserkalkwerke A.-G.). Can. 282,926, Aug. 28, 1928. A hydraulic cement comprises hydraulic lime-alumina silicates, and a mixt. of $NaHSO_4$ (0.6%) and NaCl (0.3%) incorporated therewith.

Acid-proof cement. I. G. Farbenind. A.-G. Brit. 283,471, Jan. 8, 1927. A water glass soln. is mixed with a powder contg. substances such as tungstic acid, salts of fluorozirconic, fluorogermanic, fluoric, fluorotitanic, fluorotantalic, fluoroniobic and fluorostannic acids, Si, Si alloys, fluosilicates, cryolite or Al, having a strong capacity for combining with alkali as measured by the method described in Brit. 256,258 (*C. A.* **21,** 2972). Small quantities of these substances may be admixed with quartz sand for further admixture with water glass. Cf. *C. A.* **22,** 3756.

Cementitious compositions. Jesse A. McCormick and Charles A. Cabell (to National Lime Association). Can. 283,431, Sept. 18, 1928. A cementitious compn. comprises hydrated lime, Ca aluminate, $Al_2(SO_4)_3$, a slightly sol. carbonate, and from 0.1 to 0.3% of sugar. Cf. *C. A.* **22,** 1026.

Composition for pavements. A. Kennedy. Brit. 284,100, March 4, 1927. A mixt. of natural or artificial cement (suitably portland cement), sand and crushed granite, limestone or slag is applied in a dry state to the surface of tar macadam roads before rolling; after rolling addnl. material may be applied, brushed in and treated with water, and the rolling and other treatments may be further repeated.

Building material. Thv. Hansen. Norw. 45,031, April 2, 1928. A mixt. of finely ground peat with a size of particles below 0.2 mm., sawdust, soapstone powder and magnesia cement is molded with or without pressure.

"Acoustic wall" for avoiding reflections of sound inside of buildings. Georg von Arco (to Gesellschaft für Drahtlose Telegraphie m. b. H.). U. S. 1,684.078, Sept. 11.—A coating of flaky sound-absorbing material such as flaky asbestos assocd. with binding material is used for surfacing walls.

Non-inflammable coating composition. Sigurd Jenssen. Norw. 44,529, Oct. 24, 1927. Cement and burned magnesia are mixed with whey with or without an addn. of pigments. The whey may also be applied in evapd. dry condition mixed with the other components.

Impregnating wood. A. Dessemond. Brit. 283,703, Dec. 1, 1926. In processes

involving successive impregnation of wood with different liquids, followed by vacuum treatment, the liquid extd. by the vacuum treatment is measured in order to control the degree or duration of the vacuum and to det. the proportion of the liquids remaining in the wood.

Preserving wood. GILBERT GUNN. U. S. 1,684,222, Sept. 11. Wood is treated with a slightly acid aq. soln. of $K_2Cr_2O_7$ and $CuSO_4$ and their reaction products, contg. more than a mol. proportion of $K_2Cr_2O_7$. Cf. *C. A.* **22**, 1838.

21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

The synthesis of liquid fuels. DANIEL FLORENTIN. Lab. municipal de Paris. *Chimie et industrie* Special No., 228–34(April, 1928); cf. Kling and F., *C. A.* **20**, 1587, 1791; **21**, 2466, 2470, 3197; **22**, 400.—A review dealing briefly with the various processes proposed, and more fully with the Bergius process and the results obtained therewith by Kling and F. A. PAPINEAU-COUTURE

Chemical study of Italian fuels. CARLO PADOVANI. *Chimie et industrie* Special No., 181–7(April, 1928).—An outline of the systematic investigation being carried out on the chem. compn., properties and possible industrial uses of Italian fuels, with a view to utilizing them to the best possible advantage. The results obtained so far have been described in full in a vol. published by the Ass'ne Chim. Gen. ed Appl., Rome, which will be followed by other vols. as subsequent results may warrant. A. PAPINEAU-COUTURE

A study of the determination of moisture in fuels with high oxygen content. CARLO PADOVANI AND CESARE SINIRAMED. *Chimie et industrie* Special No., 177–80(April, 1928).—In order to eliminate the errors due to oxidation, 4 methods of drying were compared: (1) in a Fischer oven through which a current of dry CO_2 was passed (time 3–4 hrs.); (2) in a Langbein app. (placing the sample in a small flask through which dry CO_2 was passed, and heating 2–3 hrs. in an ordinary oven at 100–10°); (3) drying over P_2O_5 at atm. temp. (time required 4–5 days); (4) heating at 60–70° to const. wt. in a vacuum oven at an abs. pressure of 70 mm. of Hg, after displacing the air with CO_2. The 4 methods give practically identical results (av. of 6 detns. by each method varying from 12.09 to 12.21% on the same coal), (1) being the most convenient. Even with this method increases in wt. were observed in the H_2O detn. in some samples of exceptionally moist and exceptionally easily oxidized lignites and peats. Satisfactory results were obtained by substituting N for CO_2, and the current of gas was passed through $CaCl_2$ and through $Ba(OH)_2$ water to absorb the evolved H_2O and CO_2, resp. It was found that the loss in wt. is always greater than the amt. of H_2O absorbed by the $CaCl_2$ and that the difference between the 2 is always greater than the amt. of CO_2 evolved, which is probably due to the evolution of other occluded gases, particularly N. P. and S. consider it more likely that the CO_2 evolved is produced by reaction between the coal and previously absorbed O, rather than that it was absorbed as such from the atm. A. PAPINEAU-COUTURE

Benzene. GEORGES CORET. *Chimie et industrie* Special No., 239–43(April, 1928).—A discussion of the merits of benzene as a fuel for internal-combustion engines. A. PAPINEAU-COUTURE

Coal institutes in foreign countries. STANISLAS LANDA. *Paliva a Topeni* **9**, 81–3, 97–9(1927).—L. describes various coal institutes visited in France and Germany prior to the reconstruction of the "Institute for the Economical Consumption of Fuels" in Czechoslovakia. FRANK MARESH

Advances in the chemistry of the humic acids and of coal. WALTER FUCHS. Kaiser Wilhelm-Inst. für Kohlenforschung. *Z. angew. Chem.* **41**, 851–3(1928). E. H.

The auto-ignition temperature of Diesel oil. TETSURO SUWA. Imperial Fuel Research Inst., Japan. *J. Fuel Soc.* (Japan) **7**, 589–97; (In English 53–6)(1928).—Auto-ignition temp. (hereafter denoted A. I. T.) is influenced by several factors, namely: material, shape and vol. of the crucible, kind of gas used and its quantity passed, vol. of oil drop under test, atm. pressure, and method of heating. The A. I. T.'s of several tar oils used in testing a 33 b.h.p. single-cylinder Diesel engine were detd. with an improved Moore type app., provided with a Pt crucible of 14.8 cc. vol., in an atm. of O flowing at the rate of 15 cc. per min. The diffusion block of semi-steel of 110 mm. diam. and 105 mm. height was heated at the rate of 1–2° per min., and an oil

drop under test was allowed to fall into the crucible every 2-3° temp. rise. The following results were obtained:

No.	Description		A. I. T.
1	Normal heptane		300°
2	Kerosene		256
3	Heavy oil A		256
4	Heavy oil B		263
70	Fushun low-temp. tar, crude		337
71	Fushun pitch-free oil		405
72	Fushun acid-free oil		287
73	Fushun tar acid		501
60	Okinoyama low-temp. tar, crude		430
61	Okinoyama pitch-free oil		418
62	Okinoyama acid-free oil		292
63	Okinoyama tar acid	above	580
50	Saghalien low-temp. tar, crude		409
51	Saghalien pitch- and acid-free oil		275
52	Saghalien paraffin-free oil		393
53	Saghalien tar acid	above	600

Diesel engine fuels should have a low A. I. T., to insure their combustion in the cylinder. The temp. attainable in the cylinder during the compression stroke can be calcd. by means of the formula $T = T_0\delta^{n-1}$, where T and T_0 are, resp., final and initial abs. temps. of suction air, δ is the compression ratio and n approx. 1.35 in the case of the Diesel engine. Diesel-oil specifications should include A. I. T., and the method of its detn. F. I. NAKAMURA

Chemical and economic considerations concerning wood and coal. FRIEDRICH BERGIUS. *Chem.-Ztg.* 52, 447(1928); *Z. angew. Chem.* 41, 707-11.—In studying the transformation of wood into coal, the attempt was made to shorten nature's process by using high temps. and employing H_2O (as superheated steam) to distribute the heat, thus preventing decompn. by the exothermic reactions involved. Both cellulose and wood gave practically the same coal as end products; apparently it is immaterial whether cellulose or lignin is used. By employing mechanical pressure (up to 6000 kg./sq. cm.) to imitate the great forces occurring in nature when anthracite was formed, a coal contg. 87% C was produced, and CH_4, H_2, CO and CO_2 were evolved simultaneously. The H of coal has a certain "lability" at 350° so that an enriching of the coal in H can be had by heating it with H under pressure. The practical question of dehydrating peat led to the study of coal formation, and the commercial importance of obtaining hydrogenated products from coal was stimulated by the world-wide demand for oil. In utilizing wood chemically so that digestible carbohydrates may be made from it, the cellulose skeleton must be retained. Energy in the carbohydrates is utilized very efficiently by animal organisms both for fuel and for tissue building. How much better it would be for firewood to be used for food rather than for fuel, especially when coal can be had so cheaply. The conversion of cellulose into digestible carbohydrates is based upon hydrolysis with concd. HCl, and later removal of the reagent, without decompg. the carbohydrate formed. Far-reaching technical, economic, transportation and other problems must be studied before the process can be employed commercially. For Germany this matter is especially important as 60% of its meat supply comes from hogs grown within the country itself. W. C. EBAUGH

The origin of coal. WALTER OBST. *Chem.-Ztg.* 52, 629(1928).—A lecture by Bergius (preceding abstract) reminded O. of an accident to a sack of corn meal which became wet and was placed above an oven to dry. After 4-5 weeks the meal was found to be dry and unchanged, except for slight dextrinization near the bottom, but the bottom of the sack had portions of coal up to 10 cm. in length. The temp. was detd. to be 70-90° at the place in question, and the pressure could not have exceeded 50 kg., the total weight of the filled sack. It points to the possibility of coal originating at low temp. and pressure from carbohydrates admixed with certain oils. W. C. E.

Washing of coal by flotation: effect of alkali chlorides contained in the water on the stability of the foam. M. E. BERTHET. *Chimie et industrie* Special No., 217 (April, 1928).—The stability of the foam decreased very rapidly with increase of NaCl up to about 3 g. per l. of H_2O; at higher NaCl concns. the rate of decrease in stability with increase in NaCl was much lower. The stability is not increased by increasing the time of agitation. A. PAPINEAU-COUTURE

Two laboratory investigations on the dissociation of coal. I. Laboratory appara-

tus for studying the low-temperature carbonization of coal. A. GILLET AND M. RORIVE. *Chimie et industrie* Special No., 163–4(April, 1928).—In the lab. app. used for investigating low-temp. carbonization, there is a gap between Fischer's small still (taking about 50 g. coal) and his large rotary still (taking a few kg. of coal), which G. and R. have filled by designing an app. which can handle about 400 g. in 1 hr. It consists essentially in an inverted funnel heated on a molten metal bath (as in the Piron-Caracristi process used commercially in the Ford plant for the treatment of 4000 tons per day). The upward-projecting stem of the funnel is connected to the usual condenser and is provided with a tube for introducing steam or a suitable gas and for a thermo-elec. couple for detg. the temp. Preliminary tests with a Ruhr coal with 28% volatile matter confirmed the results obtained by Audibert, Ste.-Claire-Deville, and others on the coking of coal, bringing out particularly the effects of the size of the coal grains, of the rate of heating and of the addn. of a few % of infusible powders (particularly of semi-coke) on the properties of the semi-coke. **II. Extraction of coal with cyclohexanol at 360°.** A. GILLET AND H. DETAILLE. *Ibid* 164–5.—Treatment of coal contg. 28% volatile matter with cyclohexanol at 360° in presence of a catalyzer (a mixt. of reduced Fe and Sn) gave 44% of combined extract and volatile matter, which was increased to 54% on treating with a 2:1 cyclohexanol-PhOH mixt. The ext. was non-volatile at atm. pressure and contained at least 50% cyclohexanol, which was combined in an unknown manner. The cyclohexanol-PhOH ext. was sol. in concd. H_2SO_4; only traces of this ext. were sol. in concd. NaOH soln., giving on acidification traces of products having a sharp, cresol-like odor. A. PAPINEAU-COUTURE

The chemical utilization of coal. CH. BERTHELOT. *Chimie et industrie* Special No., 166–76(April, 1928); *Science et industrie* 12, 90–3; cf. *C. A.* 22, 152.—An address dealing with carbonization and liquefaction of coal and with the utilization of the products of gasification of coal. A. PAPINEAU-COUTURE

The chemical composition of the hydrocarbons in coal and its effect upon the coking of coal. HUGO NOVÁK AND J. HUBÁČEK. *Paliva a Topeni* 9, 165–70, 187–96(1927).—The authors summarize and review 14 papers published since 1923 and commence by dissolving coal in tetrahydronaphthol at 18 atm. and 300°. Brown coals "Karolina" and "Hedvika" and black coals "Max" and "Jaroslav"—all from Czechoslovakia—were used. The above treatment seps. the coal into 2 fractions—one contg. most of the hydrocarbons and a residue. By treating these fractions with solvents as benzene, petr. ether, EtOH, pyridine, and NaOH, groups were formed with similar and characteristic properties. For greater precision the large groups were sepd. from small groups representing a small percentage of the hydrocarbons but which form a transition from one large group to another. FRANK MARESH

Results of agglomeration of coals by means of hydrocarbons partially dehydrogenated by sulfur. ANDRÉ LÉAUTÉ. *Compt. rend.* 187, 227–9(1928); cf. *C. A.* 22, 3761.—Actual tests on coals agglomerated with different heavy oils show that the partial dehydrogenation of the oils by means of S increases very markedly the strength of the briquets. G. CALINGAERT

The determination of sulfur in coal with the aid of a turbidimeter. B. TYKAČ AND JINDŘICH STREIT. *Paliva a Topeni* 9, 133–5(1927).—One g. of coal is burned in the usual way in a calorimeter bomb. The bomb is washed thoroughly into a beaker and filtered. The soln. is titrated with 0.1 *N* Na_2CO_3 against methyl orange and boiled to remove all traces of CO_2. From the acidity (1 cc. *N* Na_2CO_3 corresponds to 16.035 mg. S) a rough estn. is made, and a vol. corresponding to the range of the instrument is pipetted out, treated with 1 cc. HCl (1:1), and made up to 100 cc. In the turbidimeter, a $BaCl_2$ capsule is added to the soln., and the depth of the soln. at which the flame disappears is read. From the formula $S = 0.6 + 15.3/c$, where c is the depth in cm., the mg. of sulfur (S) are computed. From numerous tables, the agreement of the total S in coal with gravimetric and the Eschka method is very close (less than 0.06% difference). (A complete résumé is given in German.) FRANK MARESH

The sulfur problem in burning coal. J. F. BARKLEY. Bur. Mines, *Tech. Paper* No. 436, 7 pp.(1928).—Furnace reactions in burning coal are discussed and the effect of S content on clinkering is indicated. Clinkering of the ash does not vary directly with the S content of the coal. Often less than 10% of the S goes into the ash, and much goes off as SO_2 or SO_3. As the flue gas temp. drops SO_3 gas begins to unite with water vapor, which on condensation first appears as acid of 98.3% concn., which absorbs water upon cooling. A curve shows the dew-point temps. for the different partial pressures of the acid. W. H. BOYNTON

Hydrogenation of Japanese coals. YOSHIKIYO OSHIMA AND SABURO TASHIRO. The Imperial Fuel Research Institute, Japan. *J. Fuel Soc.* (Japan) 7, 637–42; (In

English 70-2) (1928).—This is the first report on hydrogenation of Japanese coals. The following 3 points were considered: conditions governing the nature of the oil produced, easy sepn. of oil from the residue, and factors necessary for industrial application. The app. used was an autoclave of Ni-Cr steel heated externally by an elec. heater. The sample of coal and H, at a definite pressure, was charged into the autoclave, and the latter was heated at a definite rate and shaken horizontally. The pressure and the temp. were observed every 2 min. The relations between temp. and pressure, pressure and time, and time and temp. were illustrated by 3 curves, and the results are fully discussed. The following results were obtained with certain Japanese coals:

A Analysis of Coal

Sample	Volatile matter	Fixed C	Ash
A	45.38	37.62	17.00
B	41.44	45.78	12.78
C	37.32	52.54	10.24
D	40.98	50.96	8.06
E	42.34	38.86	17.80
F	54.12	29.30	16.58

B Results

Sample	Light Hydrocarbons	Heavy Hydrocarbons	Total Oil Yield	H consumption
A	8.4	76.1	84.5	4.8
B	8.0	70.8	78.5	5.4
C	6.7	60.8	67.5	5.5
D	3.3	75.6	78.9	6.2
E-1	6.1	90.3	96.4	5.0
E-2	15.8	79.4	95.2	4.8
F-1	21.3	46.0	67.3	6.8
F-2	15.4	63.4	78.8	5.8
F-3	8.3	81.7	90.0	3.6

(Figures are based on pure coal.) The detailed report on further investigation will be published in the future. F. I. Nakamura

Influence of varying the pressure and duration of heating upon the results of low temperature distillation of coal. R. Vondráček and B. Hlavica. *Paliva a Topeni* 9, 49-56, 69-74, 85-9, 101-5(1927).—Lignite from Handlová (Slovakia) and coal from Moravian Ostrava were distd. at atm. pressure and in a vacuum The duration of heating varied from 7 to 1000 hrs. The usual methods of analysis were used or improved in some detail for the expts. attempted. The results of the distn. of both coals were compared with each other and with those of other experimenters. The authors question some results obtained by Börnstein to the effect that coals poorest in O should yield the most CO_2. An apparent evolution of H from lignite begins at 400°, while coal evolves H at a lower temp. CH_4 is evolved at the same temp. in both coals. The yields of CH_4 and H are about the same. Brown coal, in fractions below 300°, gives more CO_2 and less of the higher homologs of CH_4. The semi-cokes from both types of coals attain the same compn. at 620°. With a slow rate of heating, the compn. changes in the range of low temps. with a larger yield of gases, primarily CH_4, than rapid heating. The calorific value of gases from lignite was increased 30% by slow heating up to 520°, but 38% for coking coal. Since the gases contain only about 10% of the calorific value of the coal, the effect of slow heating is almost negligible. The yield of tar was increased but slightly under slow heating, but the content of phenols and asphalt was decreased. Distn. *in vacuo* has no fundamental influence upon the compn. of the carbonaceous matter of coal. Through secondary reactions in the gaseous phase, the compn. is altered with an increase of H. The wt. of evolved gases is not changed. Under rapid heating in a vacuum, the calorific value of the gases is lowered, but under slow heating in a vacuum, the calorific value of the gases is increased. Distn. *in vacuo* has an unfavorable influence upon tar formation; the content of free C, phenols and asphalt is increased. An unexplained observation was noted, that in the dry distn. of lignite in a vacuum, the content of N and S in the semi-coke was lowered very markedly. This was scarcely noticeable in the coking coal. Low-temp. distn. in a vacuum will hardly have any practical use. A greater significance can be attached to the rate of heating. Elementary N was liberated from both coals below 500°. Brown coal acquired electroconductivity at a slow rate of distn., *in vacuo* at 570°, while F. Fischer's observations showed that under normal conditions of distn. a temp. of 700° is required. (The article is given in French, and only the résumé is in Czech.) Frank Maresh

Pressure extraction of bituminous coal with tetralin under pressure. E. BERL AND H. SCHILDWÄCHTER. *Brennstoff-Chem.* **9**, 105–13(1928).—A gas coal and a semi-bituminous coal were extd. with tetralin under 6.5 atm. and at 250°. The yields of extractable matter on exhaustive extn. were 20.3 and 16.6%, resp. By distn. of the extd. residue at low temps. little tar was recovered showing that extn. with tetralin removed most of the tar-forming constituents. The tetralin extract contd. 1.43% acid compd. (solid phenols), 0.034% bases, 7.84% asphalt and resinous compd., and 27.1% neutral oils. The neutral oils were sepd. into unsaturated (79%) and saturated (13.8%) compds. From the former, 11 different hydrocarbons were isolated, $C_{12}H_{20}$ to $C_{28}H_{34}$ having formulas C_nH_{2n-4} to C_nH_{2n-18}. The saturated compds. were waxes of the formula C_nH_{2n+2}. Petroleum-ether-insol. asphalts were shown to possess aromatic structure.
J. D. DAVIS

Carbonization in vertical retorts. JAMES L. HYSLOP. Belfast Corp. Gas Works. *Gas J.* **183**, 447–9(1928).—Carbonization has now reached a higher efficiency in continous vertical retorts than in any other form. Eighty-five % of the potential heat in coal is returned in one form or another to the consumer. The process has great flexibility adapting it readily to any class of coal and permitting a control of products to meet market conditions, in conjunction with steaming to which it is well adapted. The extra coke consumed in steaming to produce a certain addnl. no. of therms of gas was found to be 40% of that required by a blue water-gas plant. Twenty to twenty-five % of the coke produced is used in heating the retorts. The absence of clinker formation permits long operation without interruption for cleaning. The quality of gas is seriously reduced for several hrs. after cleaning. Data are given showing that this can be largely eliminated by cleaning out one-half of the grate at a time. Because of the low temp. of the coke discharged and other features, 35–40% of the potential heat in the coke consumed may be utilized in the generation of steam. This is about twice the amt. available with horizontals. By using a high-velocity induced-draft fire-tube boiler, sufficient steam may be produced by this waste heat to meet all of the requirements of the plant. Steady pressure at the gas off-take, as near to atm. as possible, is necessary for the maintenance of yields and quality of products and the working of the plant, especially the avoidance of pipe stoppage due to the hard dry condition of the tar caused by fluctuating pressure or heavy vacuum. This control is secured by foul gas mains of ample size and a sensitive governor as close to the collecting mains as possible. Well screened, nut-size coal gives the best results with steaming. The presence of fines is detrimental because of obstruction of the flow of gases through the charge. In connection with high thermal yields of gas from certain classes of coal, it is shown, in a specific instance, that, although the coke yield remained about the same, the increase in gas-therm yield per ton of coal, by using a higher quality coal, was more than offset by the decrease in tar and NH_3 yields, so that the cost per therm of gas was actually greater.
F. S. GRANGER

Carbonization of anthracite and semi-anthracite fines for the production of hydrogen to be used in the synthesis of ammonia. J. DEMAY. *Chimie et industrie* Special No., 188–201(April, 1928).—Lebeau has shown (*C. A.* **17**, 3411; **18**, 3107; **19**, 3010) that carbonization of low-volatile coal gives a gas very high in H (up to 80% and over). D. suggests the carbonization of such fines for the production of H. The use of the types of oven at present in use for the manuf. of coke or of coal gas has been found unsuitable for the purpose; but lab., semi-com. and com. scale expts. have shown that such a carbonization could successfully be carried out with a good yield of gas contg. 50% H and over by inserting a perforated tube into the mass of coal to ext. the gas. As such grades of coal are infusible and non-coking, continuous feeding and withdrawal of the coal could easily be carried out. The relatively small quantity of CO (up to about 15%) present in the gas could be eliminated by synthesis of MeOH, as in the Claude process for the purification of H from coke-oven gases. The advantages of the proposed process are briefly discussed.
A. PAPINEAU-COUTURE

Low-temperature carbonization of Australian lignite. DAVID BROWNLIE. *Ind. Chemist* **4**, 284–6, 290(1928)—The enormous deposits of lignite in Victoria occur principally in 3 main areas, Latrobe Valley, Port Albert and Altona. The Marwell lignite from Latrobe Valley has about 40% moisture and 7400 B. t. u. per lb. On drying the prox. anal. is Fixed C 41.5%, volatile matter 55.5, ash 3.0. The exptl. work was carried out, in a plant of semi-com. size, in a cast-iron vertical retort, mechanically continuous in operation and externally heated, of "considerable" height, tapering to a larger diam. at the bottom. Producer gas + air was introduced at the top of the setting and travelled downwards, while the gases and vapors from the lignite passed off at the top in the usual way. Some internal heating could also be provided by passing

products of combustion or the residual gas from the process, heated to any desired temp. in 8 nichrome vertical tubes, upwards through the charge. The raw, wet lignite being almost impossible to carbonize, briquets (small circular tablets 2.5" diam. × 1.75" thick) were used. Three methods of carbonization were tried: (1) low temp. 650° with simple external heating; (2) ditto + a very small quantity of internal heating; (3) ditto + more internal heating by heating the gas to be introduced at the bottom of the charge to 540°. The results of a no. of runs are tabulated. The briquets used had 12–13.75% moisture and a B. t. u. per lb. of 8770 to 9030. The carbonized briquets were excellent, having a B. t. u. per lb. of 13,750, less than 4% ash, 4.5 to 11% volatile matter. They were free burning and absolutely smokeless. They were, however, somewhat friable and hygroscopic. E. G. R. Ardagh

Combustion with oxygen-enriched air. W. Gumz. *Feuerungstech.* **16**, 73–6; 88–90(1928).—G. illustrates the effect of O enrichment by computing the case of a fire-tube boiler. Given proper equipment and cheap O, enrichment is entirely practical, especially for peak loads. Ernest W. Thiele

Manifestations of combustion efficiency. R. Saxon. *Chem. News* **137**, 98–9 (1928).—An app. is described to show the presence of unburned hydrocarbons and soot in the exhaust of internal-combustion engines: part of the exhaust gas is lead through a Venturi tube, drawing in a certain amt. of air. The mixt. is passed over a Pt catalyst, which will glow in the presence of hydrocarbons, and then over a mass of an oxidizing salt, which will glow in the presence of soot. The suggestion is made to increase the efficiency of the engine by replacing the muffler by a turbine, independently driven and used to increase the rate of removal of the exhaust gases. G. C.

The liquefaction of Bohemian wax coal with hydrogen under pressure. Hugo Novák and J. Hubáček. *Paliva a Topeni* **9**, 145–58(1927).—Bohemian wax coal (Corona) from Karlovy Vary (Karlsbad) has been subjected to the action of H at a pressure of 200 atm. and a temp. of 400–450°. The expts. were carried out with 600 g. of coal in a rotating autoclave of 5 l. capacity. Heating at the above conditions for 2 hrs. transformed 50% of the dry coal into liquid oils. Catalysts Sn, Cd, Bi, $ZnCl_2$, Fe_2O_3 and mixts. of Sn with $NiCl_2$, $ZnCl_2$ and NiO were tried. The $ZnCl_2$ acts as a neg. catalyst, while Sn, Cd, Bi, etc., have little or no influence upon the rate of reaction or degree of liquefaction. The yield of tar was one-half of the liquid products, and the chem. compn. of the products was changed by hydrogenating. More than 50% of the liquid product distd. over below 250°. The tar contains about 4% gasoline and solar oil. The gasoline and illuminating oils from liquified coal are equal in quality to those obtained from crude oils so that the refining, especially of benzene, will offer no difficulties. The higher boiling oils contain about $^1/_3$ gas oil and 60% paraffin which corresponds to the compn. of tars from the wax coals. From the fractions boiling above 300°, paraffin wax, gas oil, heavy paraffin oils and other products (phenols, creosotes, etc.), corresponding to destructive distn. products of wax coal tar are formed. (A complete résumé is given in English.) Frank Maresh

Effect of moisture content of coal and coke on oven capacities. Erich Dubois. *Gas u. Wasserfach* **71**, 795–8(1928).—The influence of high water content of coal on oven capacity is analyzed and illustrations and tables are given. Increase of moisture causes a rapid decrease in oven capacity. High moisture content of coke is especially detrimental in self-contained gas producers, and should be limited to 10%. R. W. Ryan

How does coal burn? v. Jüptner. *Feuerungstech.* **16**, 157–61, 172–5(1928).—The greater heat produced when C burns to CO_2 makes it likely, though not certain, that this is the primary reaction of C and O_2, rather than combustion to CO. It is also more probable that a mol. of O_2 will strike the C surface so as to produce CO_2 rather than CO. The expts. of other authors are discussed, but no conclusion is reached. Ernest W. Thiele

The Ruths steam accumulator. R. A. Langworthy. *J. Western Soc. Eng.* **32**, Tech. Papers, 373–88(1927).—The theory and applications of the steam accumulator are discussed. The device acts like a storage battery, storing up steam at times of light demand and releasing it to carry the peak loads. D. Gordon

The Benson process for producing high-pressure steam. H. Gleichmann. *Z. Ver. deut. Ing.* **72**, 1037–46(1928); cf. *C. A.* **22**, 3032.—The principles of the process and structural details of the Benson boiler are discussed. Sketches are shown of exptl. boilers; these can generate 3 to 3.5 tons of steam at 230 atm. abs. Feed-water problems and the design of plants are described. D. Gordon

The heat input of irradiated boiler heating surfaces. O. Seibert. *Arch. Wärme-*

wirt. **9**, 180–8(1928).—An elaborate calcn., for a specified boiler, of the radiant heat input at various points on the tubes. ERNEST W. THIELE

High pressure boiler with indirect heating of the Schmidt Heiszdampf-Gesellschaft. BRUNO SCHAPIRA. *Feuerungstech.* **16**, 196–8(1928).—In this system, the plant steam is generated by means of steam at still higher pressure; this steam is in coils, and travels by natural circulation in a closed system between furnace and boiler. Thus any sort of feed water may be used, and no joints or large masses of water are exposed to the fire. ERNEST W. THIELE

Heat transfer by radiation in gas-filled spaces. WILHELM GUMZ. *Feuerungstech.* **16**, 181–5(1928).—Calcns. are given, based on the latest expts. on the absorption and emission of radiation by CO_2 and H_2O, which show that where these gases are present the radiation as calcd. by the usual methods must be reduced by a factor depending on the compn., thickness, and temp. of the gases. It follows that the side walls of a furnace are more severely heated than has been supposed, and that the kindling arch often used with low-grade fuels is undesirable. ERNEST W. THIELE

Protection of soot blowers against the effect of high temperatures in the furnace. HARRAEUS. *Feuerungstech.* **16**, 61–3(1928).—H. gives brief descriptions of about 12 means of protecting blowers when not in use. ERNEST W. THIELE

The question of materials for furnace and boiler plants. WINTERMEYER. *Feuerungstech.* **16**, 169–72(1928).—A condensed discussion of the choice and treatment of materials for boilers and grates. ERNEST W. THIELE

Possibilities in the development of supplementary powdered coal burners. W. GUMZ. *Feuerungstech.* **16**, 41–3(1928).—Calcn. shows that fine grinding greatly increases the capacity of supplementary powd. coal installations; the coarse particles do not burn on the grate, as was formerly supposed. Advantage should be taken of the properties of powd. coal by increasing the radiant heat absorption and by preheating the air. ERNEST W. THIELE

Top-fired annealing furnaces. OLIVER P. LUETSCHER. *Iron Age* **122**, 211–2 (1928)—Raw producer gas is brought from a mech. producer by steel plate flues lined with insulating brick. L. describes a new method of applying the gas. The system can be applied to existing furnaces with little change. It is equally applicable to both intermittent and direct-fired tunnel kiln types of furnaces as well as to other fuels such as powd. coals or liquids in combinatoin with gas. H. C. PARISH

The Magdeburg gas works. W. SCHWEDER. *Gas u. Wasserfach* **71**, 769–73 (1928).—Original plans and improvements to the Magdeburg gas works are given as well as some technical details of operation. R. W. RYAN

Gaseous carbonization products. P. LEBEAU. Faculté de Pharmacie, Paris. *Chimie et industrie* Special No., 73–90(April, 1928).—The carbonization of various sugars, starches, cellulose, lignins, peat, lignites, bituminous coal and anthracite was studied in the lab. by heating 1 g. in an elec. furnace, the temp. of which was increased by steps of 100° which were each maintained const. for 1 hr. All of the gases evolved at each temp. were exhausted by means of a Hg pump, the condensable vapors being liquefied in a condenser immersed in CO_2 snow at —80°. The total vol. and compn. of the gases given off at each temp. were detd. and plotted against temp. Results which have already been published (*C. A.* **17**, 3411; **18**, 3107; **19**, 3010) are conveniently assembled and discussed, and a tentative classification of fuels according to their gaseous carbonization products is given. A. PAPINEAU-COUTURE

Gas analysis. A simple and accurate apparatus. ANON. *Gas World* **89**, 170 (1928).—The app. was designed by L. Silver, of the Kensal Green gas works of the Gas Light & Coke Co., for complete gas anal., including the detn. of H_2 and CH_4 by explosion of the whole of the residual gas from the absorptions. The large vol. of O_2 required is measured with the help of an auxiliary 100 cc. pipet located beside the usual 50 cc. gas buret and a stationary levelling tube. The 3 are connected at the bottom, by tubing and cocks, with each other and with a Hg levelling bottle. Hg is used, instead of water, for displacement, etc., throughout the app. The measuring vessels connect at the top with the capillary manifold from which are suspended an absorption and an explosion pipet, joined at the bottom, through a T connection, to a second Hg levelling bottle. At the top of the absorption pipet is a 3-way Greiner cock with one lead to the manifold and the other outside and bent downward for drawing in or expelling the various absorbing reagents or gas samples. The manifold is also provided with an outlet closed by a cock. After the absorptions, the auxiliary pipet is filled to the 100 cc. mark with O_2 and its bottom connection is closed. The buret is then nearly filled with O_2 and placed, by means of a 3-way cock at its junction with the manifold, in communi-

cation above with the auxiliary pipet so that the total vol. is read together. The further procedure is obvious. F. S. GRANGER

Desulfurizing gases. BRUNO WAESER. *Chem.-Ztg.* **52**, 617–8, 638–40, 658–9 (1928).—The importance of removing S from gases met in industry can scarcely be over-estd. The washing processes of Burkheiser (1907), Feld (1907–9) and others similar to theirs have not been very successful. Purifying boxes, with mechanical improvements, have maintained their superiority. Even coke ovens must purify their gas if it is to be used in cities. The use of alk. absorbents was more important before activated C took its place as a purifying agent. Dil. solns. of Na_2CO_3, NH_4OH, etc., with or without suspended Fe oxides, first absorbed H_2S from the gases, and later regeneration is effected by blowing air through the mass, thus pptg. S itself (cf. Seaboard-Koppers processes). The financial success depends upon whether there is at hand a market for the S, thiosulfates, thiocyanates, cyanides, etc., formed. The process removes 85–90% of the S and uses 1 kg. Na_2CO_3 for 8 kg. of H_2S. Specially activated Fe and Ni oxides yield superior results. American plants using petroleum as crude material yield gas rich in S but low in CN derivs. The operation of certain California gas plants is cited to show how the use of alk. absorbents with oxides of Fe or Ni, and the admixt. of air, is carried out. Late exhaustive tests of the Burkheiser and Feld (modified) processes have shown them to be unsuccessful from an economic standpoint Gluud and Schönfelder use aq. suspensions of Fe oxides, and others propose that Cu, Ni and Mn compds. be employed. ZnO, CuO, WO_3, MoO_3, Fe_2O_3, oxides of the alkalies, alk. earths and the earths themselves have been used. Proposals to use $Ca(OH)_2$, NH_3 solns., alkali hydroxides or carbonates, etc., come repeatedly in patent literature; similarly processes based upon the reaction of H_2S and SO_2 come up occasionally. The use of activated C goes back to 1879 (Lugo). Various forms of C are now employed; with an excess of air admitted to the gas and then the mixt. led over activated C good results have been attained. As much as 100% S in excess of its own weight can be liberated. Very full references to German, French, British and American patents are given. W. C. EBAUGH

The influence of inert gases and water gas on the rate of flame propagation in technical gases. K. BUNTE AND A. STEDING. Gas Institut. *Gas u. Wasserfach* **71**, 773–8(1928); cf. *C. A.* **22**, 3977.—Measurements were made of the rate of flame propagation for mixts. of varying percentages of air with coal gas, and mixts. of coal gas with 16.7% N_2, 16.7% CO_2, 16.7% flue gas and 33.5% water gas, resp., as well as Karlsruhe city gas. Curves are given for the variation of the rate of flame propagation with percentage gas in the gas-air mixt. CO_2 decreased the rate of flame propagation to a much greater extent than N_2, while water gas increased the rate of flame propagation markedly (from about 42 to 79 cm. per second for gas air mixt. contg. 22% gas). The influence of flue gases in lowering the rate of flame propagation was roughly proportional to the CO_2 content. The addn. of 4.7 and 9.1% methane reduced the rate of flame propagation slightly. These differences in rate of flame propagation are important from the gas users viewpoint as the height of the inner cone of the flame is greater with N_2 addns. than with water gas addns. and this difference increases rapidly with decreasing B. t. u. of the gas. A larger flame gives a lower concn. of heat. Curves are given for flame heights. R. W. RYAN

Natural gas as a raw material for chemical manufacture. R. T. ELWORTHY. *Ind. Chemist* **4**, 275–8(1928).—The present uses of natural gas are listed and the processes for making various products (carbon black, chlorinated constituents, ethylene glycol, H, He, etc.) are briefly described. Much information on the natural gas situation in Alberta, Canada, is given. E. G. R. ARDAGH

Development problems in the exploitation of natural gas. S. J. M. AULD. *J. Inst. Petroleum Tech.* **14**, 190–218(1928).—Persian gas contg. over 10% by vol. of H_2S is sepd. from the oil by a high-pressure vertical or preferably horizontal separator at pressures varying from 60 to 100 lb./sq. in. Different formulas relating pressure drop to gas flow are discussed critically. A thin plate orifice meter connected to a recording instrument in which the differential pressure is measured directly by means of an inverted bell balanced in liquid is found accurate, for low-pressure gas, to less than 2% over a flowing range of 60,000–300,000 cu. ft./hr. The boiler of a hot-water supply app. heated by the complete combustion of gas contg. 6–10% by vol. of H_2S showed no signs of pitting or corrosion and practically no scale after 2 yrs. continuous use. Gas contg. H_2S cannot be stripped by active charcoal because its adsorptive efficiency falls after 10 days' use to about 50% because of the deposition of elementary S in the pores of the charcoal from oxidation of H_2S by traces of air admitted with the gas or the steam. The factors affecting the efficiency of the oil absorption process are the

temps. of the gas and oil, the pressure, the gas/oil ratio, the mech. design of the absorber and the nature of the absorbent. Gasoline engines used on drilling rigs have operated satisfactorily on natural gas contg. "several" percent of H_2S without trouble from corrosion or undue wear. STEPHEN LACEY. *Ibid* 218–21.—A written discussion on the flow of gas in pipes. Curves are given showing the coeff. of friction of a fluid in "smooth-drawn brass" and uncorroded cast-Fe pipes of circular cross-section.

R. E. SCHAAD

Retort construction and the constitution of low-temperature gas benzine. YOSHISADA BAN. Imperial Fuel Research Inst. *J. Fuel Soc.* (Japan) 7, 615–24; (in English 62–7)(1928).—A review of work of several investigators on the compn. of low-temp. light oils. The low-temp. plant at which B. made his investigation consists of 6 cast iron vertical retorts, the total capacity of which is 6 tons per day. The retort is 11 ft. high and slightly tapered; its section is 5" × 2'6" at the center. The retort is covered with carborundum brick to avoid local over-heating, and is heated in horizontal flues, which run backward and forward up to the chimney. The results are illustrated with curves and are discussed in detail.

F. I. NAKAMURA

Carbon as an economical substitute for gasoline in explosion motors. CHARLES ROUX. *Chimie et industrie* Special No., 218–27(April, 1928); cf. *C. A.* 22, 3757.—Peat contg 90% H_2O can be economically treated by mech. means on a com scale to give a granulated product at 75% H_2O content, which can easily be reduced to 50% by air-drying and then to 25% in a dryer using waste heat from a carbonization plant (the details of the process are being kept secret for the time being). Farm tractors equipped with gas producers when operated with carbonized granulated peat ("granol") showed little or no loss of power as compared with the same motor run with gasoline; while with wood charcoal there was a loss of 25–30% power but the motor otherwise ran quite successfully. R. gives a very detailed description of his experience during a 15,000-km. run in a Ford-Montier racing car equipped with a C. G. B. gas-producer, which was fed with "granol" for about 1000 km. and with ordinary charcoal (as used for household purposes) for most of the time. Conclusion: With the present stage reached in the development of gas producers for automotive engines, granol is practically equiv. to gasoline as regards the power developed in the engine and is as reliable and easy to handle; wood charcoal has the only disadvantage of a loss of 25–30% power, which, in new engines, can be compensated by increasing the bore of the cylinders and the compression Raw wood possesses certain disadvantages; it is better suited for stationary producers, but could be used (*e. g.*, in the colonies) with a considerable measure of success for automotive engines.

A. PAPINEAU-COUTURE

Ammonium sulfate: present processes of obtaining it in gas and coke plants. CH. ARNU. *Science et industrie* 12, No. 170, 42–7(1928).

E. H.

The cycle process for ammonia recovery from coke-oven gases. V. I. DENISOV. *J. Chem. Ind.* (Moscow) 5, 13–8(1928).—In the cycle process (cf. Fokin, *C. A.* 21, 3730) coke-oven gases are washed by water trickling in the scrubbers which dissolves both free NH_3 and NH_4 salts. The weak crude NH_3 water above the coal tar is steamed for the recovery of free NH_3 which distils together with some water and forms concd. NH_4OH. Fixed NH_3 together with some unrecovered free NH_3 remains in the stock water; the latter is used, instead of pure water, for spraying the scrubbers in distg. the next batch of coal, and the new crude NH_3 water and stock water obtained are used in the same way. There is always an excess of stock water over the amt. required for spraying the scrubbers and wetting the coal, and this excess must be dumped in the fields, involving thereby a loss of the dissolved NH_3. Another loss of NH_3 is due to the circumstance that fixed NH_3 does not distil and therefore is not recovered. In the old process combined NH_3 was recovered by distn. of the crude NH_3 water with lime. D.'s calcns. show that the treatment of stock water with lime does not pay; the expense of lime, part of which is due to neutralization of free CO_2 and H_2S contained in the stock water, and the expense of steam, are not justified by the value of NH_3 which could be obtained by this treatment after removing the free NH_3 by steam alone. In spite of involving a decrease of NH_3 yield, the cycle process produces NH_4OH at a lower cost than the old process of recovery of NH_3, which was based on the use of lime water. In the 2 yrs. which elapsed since the introduction of the cycle process in Russian coke ovens it was found that the corrosion of Fe parts of the app. by NH_3 water, which was originally feared, did not take place. In an editorial note appended to this paper, D. is flatly contradicted, and a calcn. is given which tends to show that by the treatment of crude NH_3 water and of stock water by lime NH_3 can be obtained at a lower cost than by the cycle process.

BERNARD NELSON

The cycle ammonia process. M. D. LIPYATSKIKH. *J. Chem. Ind.* (Moscow) 5,

480-3(1928); cf. Fokin, *C. A.* **21**, 3730 and Denisov, preceding abstract.—Compared with the old process the cycle process gives a lower yield of NH_3. Thus by the lime water method recovered NH_3 represented 0.22% of the wt. of the dry coal used; by the cycle process the yield of NH_3 is 0.13-0.22% of the wt. of coal. The yield of NH_3 obtained by the cycle process could be greatly improved if volatile NH_3 were entirely removed from the crude NH_3 water in the distn. column; unfortunately existent app. do not lend themselves to a complete sepn. of volatile NH_3. To recover the volatile NH_3 the crude NH_3 water is treated with a direct current of steam and, as some of the latter condenses thereby, the residual soln. of fixed NH_3 (stock water) is unduly dild. and is obtained in too large a vol. to be completely used for spraying the scrubbers and for wetting the coal. Part of this water is thrown away and involves a corresponding loss of the fixed NH_3 it contains in dil. soln. This loss could be avoided by distg. crude NH_3 water by external application of steam instead of introducing the steam directly into the water; the amount of the latter would thus remain const. and it could be completely utilized. After being thus used several times the water would become enriched in fixed NH_3 and phenols to such an extent that it would be advisable to distil it with alkali to volatilize NH_3 and to treat it either with org. solvents or with activated C to recover the phenols. It is advisable not to wet the coals to an excess, as by increasing the amt. of water used for wetting the coal the vol. of NH_3-liquor obtained is increased and the concn. of the NH_3 in the liquor is lowered; it is desired to obtain liquors as concd. as possible. NH_3 obtained by the cycle process is considerably cheaper than that obtained by the old (lime water) process, but it is contaminated with CO_2 (60 g. per l. of soln.) and with H_2S (10 g. per l.). In the manuf. of $(NH_4)_2SO_4$ the cycle process cannot compete with the more advantageous direct method of obtaining this salt by washing the coke-oven gases with H_2SO_4. BERNARD NELSON

Technological notes. HUGO NOVAK. *Paliva a Topeni* **9**, 170-82(1927).—N. reviews recent methods applied in removing phenol from ammonia water, vacuum distn. of scrubbing oils in gas plants and coke plants, dry cleaning of illuminating gases, drying of air for blast-furnace stoves with silica gel, removal of CO_2 from gaseous mixts. in ammonia synthesis, and the production of gases with a higher heating value in generators for the complete gasification of coal. FRANK MARESH

Coal tar: its treatment and its applications. R. DUCHÊNE. *Science et Industrie* **12**, No. 174, 40-6(1928). E. H.

The rational utilization of coal-tar oils and pitch. L. TRABUC. *Chimie et industrie* Special No., 333-5(April, 1928).—Discussing the problem chiefly from the French economic standpoint, T. considers that all coal tar should be distd., the creosote oils being used for wood impregnation, the naphthalene and anthracene being used for the explosives and other chem. industries and the pitch being used for road-dressing in emulsified form. The disadvantages of using coal tar as such on roads are discussed, showing that the more volatile portions, which are removed by distn., slowly evap after being applied to the road and are lost. The "Association Routiére et Chimique" has devised a process which is now being used satisfactorily for emulsifying pitch just before applying to the roads and is marketing its products under the registered trade mark of "Arcite." A. PAPINEAU-COUTURE

Producer for low-temperature tar without tar recovery. J. HUDLER. *Feuerungstech.* **16**, 63-4(1928).—The tar in the gases from producers of this type is more profitably burned with the hot gas. The advantage of the type lies in its more uniform operation, not in the tar. ERNEST W. THIELE

Tar from peat of Ostashkov district. B. V. MAKSOROV. *J. Chem. Ind.* (Moscow) **4**, 755-8(1927).—U. S. S. R. possesses enormous deposits of peat which are easily mined and have a high content of org. matter. The tar obtained from the Ostashkov peat by distn. has been studied. After the removal of water the tar appears as a dark-brown unguent possessing a sharp odor. Its d_{18} is 0.9554. The amount sol. in concd. H_2SO_4 (unsatn.) is 80% by vol., Hubl I value is 98 89, Engler viscosity 3.2 at 50°. The tar oxidizes energetically in air, particularly on stirring and warming, and then blackens while emitting fumes of NH_3, amines and water. Its elementary compn. is: C 77.85, H 10.07, N 2.95, S 2.64 and O 6.49%. It differs from ordinary peat tar by its strongly alk. reaction and abundance of N compds. By fractionating 100 parts of the tar the following products are obtained: oil 65.9, residue 26.1, gases and water 8 parts. The oil has an exceedingly unpleasant odor; its lowest boiling (benzinic) fraction (up to 150°) represents only 1.3% of its wt.; its middle fraction (b. 190-200°) consists of a mixt. of cresols and xylenols (phenols); its heavy fraction gives on cooling paraffin crystals, m. 62.1, d_{20} 0.917. The compn. of the oil obtained by distn. of the Ostashkov peat tar is as follows: phenols 11.1, org. acids 1.6, org. bases 7.6, neutral O and S compds.

3.7, neutral N compounds of the type of pyrroles, indoles, etc., 6.4, solid paraffin 5.9, liquid paraffin hydrocarbons 27.2, cyclic hydrocarbons 18.6, unsatd. hydrocarbons 17.9%. The technical utilization of this peat tar is still an unsettled problem.
BERNARD NELSON

Desirable characteristics of coke: chemical. J. D. DAVIS. Bur. Mines, *Repts. of Investigations* No. 2884, 8 pp.(1928).—Coke in general should contain not more than 4% moisture, 2% volatile matter and 1.25% S. Metallurgical coke is limited to 0.01% P. Coke ash should have a fusing temp. above 2200° F. Foundry coke should contain at least 86% fixed C. The importance of reactivity in blast furnace and water gas coke is debatable; producer coke should have high reactivity while foundry and domestic cokes should have low reactivity.
D. GORDON

Determination of the reactivity of coke. D. J. W. KREULEN. *Z. angew. Chem.* 41, 498–501(1928).—A current of air is passed at a const. speed over a weighed amt. of the coke in a porcelain tube maintained at 700°, and the amt. of CO_2 evolved in a definite period of time is detd. The boat contg. the coke, which is in the cold part of the tube while the furnace is heating up, is pushed by means of a wire into the heated portion and 2 min. are allowed for it to reach 700°. Connection is then made to the CO_2 absorption app. (a tower contg. coke moistened with 30% KOH soln.), and absorption is allowed to proceed for 5 min. The increase in weight of the tower is taken as a measure of the reactivity.
B. C. A.

The calculation of coking times when oven conditions are changed. WERNER LOHRISCH. *Feuerungstech.* 16, 133–6(1928).—By collecting available data and making reasonable assumptions, L. is able to apply the mathematical theory of heat conduction to coke-oven problems. The results agree fairly well with practice.
E. W. T.

Corrosion phenomena under steam boiler operating conditions (THIEL, LUCKMANN) 9. Capacity of the evaporating surface and the steam space of steam boilers (EBERLE) 13. Small flue gas tester (GROSZ) 1. Apparatus for separating or classifying coal (U. S. pat. 1,683,918) 1. Apparatus for carbonizing coal (Brit. pat. 283,717) 1. Rotary kiln for distilling carbonaceous materials, drying coal (Brit. pat. 283,669) 1. Distilling oil from coal (Brit. pat. 283,639) 22. Purifying distillation gases (Brit. pat. 283,948) 13. Continuous precipitation of sulfur from solutions (Ger. pat. 463,138) 18.

NÈGRE, GEORGES: **La tourbe.** Paris: Gaston Doin & Cie. 240 pp. F. 18. Reviewed in *Bull. soc. ind. Mulhouse* 94, 466(1928).

Die chemie der Braunkohle. III. Die deutsche Braunkohlen industrie. 2nd ed. Edited by E. I. Erdmann and M. Dolch. Halle (Saale): W. Knapp. 321 pp. Paper, R. M. 39; bound, R. M. 42. Cf. *C. A.* 22, 1461.

The Colliery Year Book and Coal Trades Directory, 1928. London: The Louis Cassier Co., Ltd. 104 + 1034 pp. £1 1s., net. Reviewed in *Iron and Steel Ind.* 1, 229(1928).

Briquetted fuel. LUCIEN LIAIS. Ger. 452,062, Nov. 21, 1927. See U. S. 1,603,-961 (*C. A.* 21, 168).

Liquid fuel. ANDRÉ LAURENT. Can. 282,988, Sept. 4, 1928. An addn. mixt. for liquid hydrocarbon fuels contains 700 g. essence of turpentine, 300 g. essence of cloves, 8 g. essence of cinnamon, 100 g. of hexamethylene.

Atomizable mobile liquid fuel. ARTHUR W. BURWELL (to Alox Chemical Corp.). U. S. 1,684,125, Sept. 11. Finely divided solid fuel such as coal is suspended in a colloidal gel formed from a normally liquid petroleum hydrocarbon mixt., *e. g.*, the material produced by catalytic oxidation and addn. of NaOH to fuel oil constituents.

Manufacture of peat coals. MAGNA DANNEVIG. Norw. 45,056, April 16, 1928. Mech. features of app. The hot gases from the drying and carbonizing process contg. a considerable amt. of combustible substances are burned again in a sep. app., the heat being utilized for a preliminary drying and heating of the peat mass.

Oils from coal, etc. I. G. FARBENIND. A.-G. Brit. 283,545, Jan. 13, 1927. Coal or other suitable carbonaceous materials are treated, at pressures of 75 atm. or higher and which may be up to 1000 atm., and at temps. (preferably about 300–400°) below the coking temp. of the extg. agent with hydrocarbon materials or their suitable derivs. which are liquid under the reactive conditions and which contain substances b. 100–300°. Among the extg. agents which may be used are: xylene, cresol, hydrogenated naphthalenes, aniline, alk. substances decompg. coal, oils b. above 180° obtained in the process, oils from the distn. or low-temp. carbonization of coal, lignite or mineral oils or from the destructive hydrogenation of coal, tars, mineral oils or the like or from

the catalytic hydrogenation of oxides of C under pressure. These oils may also be mixed with those b. above 300° as described in Brit. 282,691 (*C. A.* **22**, 3763). Over 50% of the coal treated may be converted into liquid oils. Catalysts and gases free from H may be present, and the process may comprise stages of successively increasing pressure.

Gas and oil production. FREDERICK T. SNYDER (to Canada Super-Coal, Ltd., to S. R. Allen and H. H. Hansard). Can. 283,635, Sept. 25, 1928. Gas and light oils are produced by feeding fuel to a gas producer, distg. said fuel by passing in contact therewith the gases of the producer, burning the solid product of said distn. in the base of the producer with a blast of air, injecting heavy oil as a cooling fluid into the products of said combustion above the zone of combustion, and subsequently increasing the amt. of gas flowing in contact with said fuel by passing additional gas into said producer above the zone of said fluid injection, and fractionally condensing the condensable distillates to sep. them from each other and from the gaseous and the solid products.

Destructive hydrogenation of carbonaceous material. CARL KRAUCH AND MATHIAS PIER (to I. G. Farbenind. A.-G.). Can. 282,876, Aug. 28, 1928. Carbonaceous materials are destructively hydrogenated by bringing the materials into intimate contact with a hydrogen-contg. gas under a pressure of at least 50 atm. and at a high temp. in the presence of a catalyst, with one or both reagents in a state of fine distribution in one another. Cf. *C. A.* **22**, 2463.

Treatment of carbonaceous material. HUBERT DEBAUCHE. Can. 282,960, Sept. 4, 1928. Carbonaceous material is subjected to low-temp. distn. and the semi-coke while retaining sufficient heat is successively and uninterruptedly submitted to screening, grading, mixing and agglomerating, thereby avoiding the necessity of any intermediate heating.

Apparatus for the distillation of carbonaceous material. EDWARDO M. SALERNI. Can. 283,205, Sept. 11, 1928. A still for carbonaceous material has an upper drying chamber through which the charge is progressively fed while being agitated and disintegrated and in counter flow to the hot gases emerging from a lower distn. chamber in which are located a plurality of troughs through which the charge is passed and agitated. The spent solid material is passed to a cooling means. The hot volatile constituents are freed from dust and condensed.

Carbonizing stove. JOSEF PLASSMANN (to Chem. Techn. Ges. m.b.H.). Can. 283,562, Sept. 25, 1928. A stove for carbonizing fuels comprises a plurality of superposed circular cells heated from above and below and at the inner wall, and enclosed by a rotatory exterior jacket to which are attached the filling means and the discharge means.

Stoking apparatus for rotary roasting generators and other containers filled with material to be stoked. CHRISTOPH STEIGERWALD. Ger. 451,987, Nov. 4, 1927.

Coal-dust furnace, in which the discharging cinders are heated by the flame of a burner arranged opposite the sloping discharge surface. EUGEN BURG. Ger. 451,912, Nov. 4, 1927.

Combination coal-dust and gas burner. MICHAEL ELBERT. Ger. 451,911, Nov. 4, 1927.

Method and apparatus for operating furnaces for steam boilers and superheaters. AKT.-GES. BROWN, BOVERI & CIE. Ger. 451,926, Oct. 29, 1927. The cooler waste gases are returned to the fire or combustion chamber and introduced as a flat or fan-shaped stream which more or less envelopes the flame.

Facilitating the charging and discharging of furnaces used in the dry distillation of bituminous materials. PATENTAKTIEBOLAGET GRÖNDAL-RAMEN. Ger. 452,008, Nov. 26, 1927. Open-ended trays are placed in layers on a car. The car rolls on wheels into a frame or cage having plates which form covers for one end of the corresponding tray. The cage rotates around a horizontal pivot. The cage contg. the car and trays is then rotated to a slanting position for charging. A channel attached to one end of the cage serving as a side cover for the trays has openings corresponding to the open ends of the trays and while the cage is in the slanting position it is charged from a hopper above. After charging, the cage is rotated to its horizontal position and the car with the loaded trays rolled into the furnace, where distn. takes place. For discharging a similar app. is used which has an arrangement for loosening the material that has baked into the trays.

Centrifugal air cleaner for internal-combustion engines, etc. CHARLES G. HAWLEY (to Centrifix Corp.). U. S. 1,684,023, Sept. 11.

Apparatus for generating illuminating and fuel gas. ERNST GOFFIN. Ger. 451,976, Nov. 4, 1927.

Plant construction (with twin generators) for making water gas and producer gas. J. Lowe. Brit. 283,909, Jan. 20, 1927.

Production of water gas and hydrogen. Herbert A. Humphrey (to Imperial Chemical Industries, Ltd.). Can. 281,814, July 17, 1918. In low-temp. carbonization and gas manuf. high coking coal is preheated in presence of O to control its coking properties; the product is carbonized at a temp. below 600° to produce lump semi-coke; the semi-coke is gasified with steam and the gas is treated with steam at high temp. to decompose the CH_4. The gas is used for the synthesis of *methanol* with the single passage of the gas over a catalyst, and the residual gas is used for *NH_3 synthesis*, after replacement of the CO by H, removal of CO and addition of N.

Retort seal. Paul G. Strassmann (to Indugas Industrie- und Gasofen -Baugesellschaft m.b.H.). Can. 282,710, Aug. 21, 1928. A seal for the base of a retort consists of an upper dry and non-gastight closure and a coöperating lower wet closure.

Purifying tars, tar oils, etc. J. Karpati and M. G. Hubsch. Brit. 283,569, Jan. 15, 1927. Tars, tar oils and other tar derivs. are treated for the removal of phenols by a solvent for phenols dild. with water (suitably at temps. of 90–150° and pressures of 1.5–6 atm.). Me, Et and Pr alcs., acetone, CH_2O and AcH may be used as solvents, and the alc. may be of 20% strength. The effectiveness of the solvents is improved by the further addn. of substances such as NaCl or Na_2SO_4 which reduce the soly. of the hydrocarbons. The more acid phenols are more easily sol. and the process may be conducted to effect fractional sepn. of different phenolic products.

22—PETROLEUM, LUBRICANTS, ASPHALT AND WOOD PRODUCTS

F. M. ROGERS

The advantages of physical methods for the refining of petroleum. A. Guiselin. *Chimie et industrie* Special No., 289–91 (April, 1928).—A discussion of the advantages and possibilities of phys. processes for the refining of petroleum, such as filtering through clay or treatment with Me_2CO, EtOH or SO_2. A. Papineau-Couture

Scientific foundations of the refining of petroleum. I. Gas and gasoline. A. E. Dunstan. Anglo Persian Oil Co. *J. Roy. Soc. Arts* **76**, 922–42 (1928). **II. Distillation methods.** *Ibid* 945–63. **III and IV. Refining of petroleum distillates.** *Ibid* 965–81, 985–98.—Four lectures on the modern art of petroleum refining, emphasizing what is known of the scientific principles underlying the major operations. G. Calingaert

Cracking under low pressure. K. Kostrin. *Neftyanoye Khozyaistvo* **12**, 39–45 (1927); *Chem. Zentr.* **1927**, 1523–4.—A comparatively low pressure is used nowadays to crack hydrocarbons. This is due to the demand for more unsatd. hydrocarbons, which are desirable anti-knock compds., as compared with higher pressures used before to eliminate the unsatd. compds. A paraffin mazout from Surakhanui (Baku) cracked in a tube still at 480–490° and 2.5–3.0 atm. gave 33.5% distillate and 59.2% residues. The residue had a flash point 12° below that of the original mazout and was suitable for fuel. The initial b. p. of the distillate was 90°; 39% distd. off below 150°. The benzine obtained contained 13% unsatd. hydrocarbons. This quantity could be decreased to 6.5% by treatment with fuller's earth, probably by polymerization of unsatd. compds. The boiling range moves simultaneously towards higher temps. H_2SO_4 acts in the same direction but more powerfully; therefore it could not be recommended for treatment. A. A. Boehtlingk

Cracking in the liquid phase. A. Dobryanskii and A. Mureyeva. *Neftyanoye Khozyaistvo* **12**, 411–3 (1927).—The cracking of oil is generally carried out in the vapor phase. D. and M. investigated the decompn. by heat in the liquid phase at 405–415° and under atm. pressure. Lubricating oils and paraffin wax were cracked. The gas obtained was collected in fractions of 500 cc. and each fraction separately analyzed; the cracking distillates were also collected separately and analyzed. It was possible to study the chem. changes during the run. Ethylene, propylene, heavy hydrocarbons and the satd. hydrocarbons by subtraction were detd. according to Dobryanskii (*Neftyanoye Khozyaistvo* **9**, 565) in the gases obtained. The amount of ethylene and heavy hydrocarbons decreases, and the amt. of satd. hydrocarbons increases with the progress of decompn. The longer side chains of aromatics are probably the first to be split at the beginning of the decompn., followed by a second splitting which leads to the formation of satd. hydrocarbons. The sp. gr. of the distillate increases and its content of low-boiling (below 150°) hydrocarbons decreases with the progress in decompn. The

cracking is not affected by the presence of pumice, coke, Cu or Fe shavings.
A. A. Boehtlingk

Comparison of the reaction products obtained by the cracking and by the berginization of paraffin. H. I. Waterman and J. N. J. Perquin. Ecole technique sup. de Delft. *Chimie et industrie* Special No., 244–57(April, 1928).—See *C. A.* **22,** 497.
A. Papineau-Couture

The combustion of hydrocarbons. Hydroxylation and (or) peroxidation. W. A. Bone. *Nature* **122,** 203–4(1928).—B. reviews a few of his early expts. on slow combustion of hydrocarbons and points out that the new peroxidation theory, while attractive on certain counts, does not contradict the evidence for the hydroxylation theory. Reply. A. Egerton. *Ibid* 204.—The action of anti-knocks indicates the existence of a chain reaction depending on the formation of some active product. This suggests the intermediate formation of active unstable peroxide, the active products formed by reorganization or decompn. of the compd. being able to continue the reaction chain.
G. Calingaert

Improvement of the combustion of hydrocarbons (in explosion engines) by nascent oxygen obtained by mixing the liquid fuel with previously oxidized terpenes. André Laurent. *Chimie et industrie* Special No., 319–23(April, 1928); cf. *C. A.* **21,** 3444.—"Targol" consists of oxidized terpenes, the exact nature of which is not divulged. Attempts to activate the terpenes by treatment with O_3 were unsatisfactory, because its excessive reactivity gives irregular results with liability of explosion in the carburetor or excessively violent explosions in the motor cylinder. Preliminary oxidation with O_2 gives very satisfactory results, as shown by the fact that about 25,000 automotive engines are now running regularly with gasoline mixed with "targol" in latitudes ranging from Belgian Congo to Norway and Sweden. The merits of this mixt. are discussed in the light of its actual performance in every-day operation from the standpoints of fuel economy, increased power, mech. and chem. effects on the motors, effects on lubrication, effects on public health. A. Papineau-Couture

Panuco oil field, Mexico. Charles L. Baker. *Bull. Am. Assocn. Petroleum Geol.* **12,** No. 4(1928).—The oil of the Panuco section varies in gravity from 12.5° to 12.9° Bé., contains 3.5 to 5.7% S, an av. of 3.5% (max. 5%) gasoline, and has an asphaltic base. Topila oil varies from 15° to 17.2° Bé. Ebano oil averages from 10.6° to 11.8° Bé. The temp. of the Panuco oil ranges from 90° to 120° F. The temp. ordinarily raises a few degrees upon the appearance of salt water. The compn. of Panuco gas is 50 to 98% CO_2, with CH_4 and possibly other petroleum derivs. taking 2nd place, and H_2S 3rd. There is also probably a little SO_2. Most of the gas will not burn. The CO_2 is derived from 2 sources: (1) the metamorphic action of hot magmas, intruding limestone (calcination) and eruptive after-effects have liberated vast quantities of it, and (2) a part has been derived by the dissolving action of the underground waters, already highly charged with the same gas from the first source, and therefore forming a solution which readily dissolves the limestone. The H_2S appears to be either entirely of magmatic origin or derived from the reduction of sulfate in soln. in the water, since practically all the pyrite and chalcopyrite found in drilling samples are entirely unaltered. The H_2S has evidently been the leading agent in the formation of tar from the oil, making it excessively heavy. The O of the asphalt can be partially or entirely replaced by S and the Panuco oil contains S in the elementary condition up to the satn. point for S at the prevailing temps. The total salinity of the *waters* analyzed ranges from 2.8 to 7.2%. It is apparent from this variation that the waters have different sources, and that there is no mingling of the waters even in the near-by fracture zones. The high percentage of K is the most remarkable feature. Three sources of K are: (1) from acidic holocrystalline rocks, (2) from potash-bearing desiccation sediments associated with possible gypsum-bearing beds known in the cordillera or other saline residues of older date, and (3) from leaching of the acidic tuffs of the Upper Cretaceous. Compared with sea water there has been the addn. of K, Ca and CO_2 radicals and the subtraction of the SO_4 and Mn radicals. (A table with 11 analyses is given.)
C. L. Cooper

Limestones as a source of oil. Parker D. Trask. *Bull. Am. Assocn. Petroleum Geol.* **12,** No. 5(1928).—A distn. of limy oozes in 2 widely sepd. regions, the Florida Bay and the Gulf of Batabanó, gave a max. yield of 2.5 gal. per ton. The chance for possible contamination of oil from surface water or from seepage from a buried non-limy formation is negligible. The fact that 1% of the total wt. of these sediments can be caused to become volatile and condense into a liquid is very significant, and indicates that such beds are potential future source beds. C. L. Cooper

Jamin action—what it is and how it affects production of oil and gas. Stanley

C. HEROLD. *Bull. Am. Assocn. Petroleum Geol.* **12**, No. 6(1928).—Jamin action is a phys. phenomenon due to alternating globules of liquid and bubbles of gas in channels of capillary dimensions. A natural reservoir may be described as a huge bundle of capillary tubes radiating in all directions from the well. The globules and bubbles offer a resistance to any hydrostatic pressure tending to push the fluids toward the open well. If this hydrostatic pressure is of sufficient intensity, it overpowers the combined resistance of all globules located on the radiating lines, but if it is not of sufficient intensity, these globules and bubbles may be said to dictate the conditions of production from the well. These alternative conditions with respect to pressure and resistance determine volumetric and capillary controls, respectively. Particular emphasis is placed upon the effects of Jamin action with regard to the rate of production, vol. produced from the well, and percentage of recovery from the sands by natural flow; also the features accompanying the use of pumps and gas lifts are discussed. The force drive is given a brief review, and the paper concludes with a description of the method of discriminating in the field between volumetric and capillary controls.
C. L. COOPER

The effect of pressure on the migration and accumulation of petroleum. F. M. VAN TUYL AND R. C. BECKSTROM. *Bull. Am. Assocn. Petroleum Geol.* **10**, No. 10 (1926).—This paper describes several expts. in which various types and arrangements of sedimentary materials, after being charged with oil and water in such a way as to simulate conditions in nature, were placed in a steel cylinder and compacted at high pressures. The results are believed to justify the conclusion that the compaction of petroliferous sediments either as the result of the wt. of the overlying load or of deformation is an important cause of the movement of oil into reservoir rocks.
C. L. COOPER

A quick method for determining porosity. W. L. RUSSELL. *Bull. Am. Assocn. Petroleum Geol.* **10**, No. 10(1926).—R. describes a quick method for detg. porosity in oil and gas sands by means of a reasonably cheap app. that can be easily carried in field work. The novel feature of the method described lies, not so much in the mechanism as in the use of $CHCl_2.CHCl_2$, which possesses the advantageous features of readily entering the pore space of all types of sand without causing disintegration and without rapid evapn. An idea of the accuracy of this method is given by an analysis of each possible source of error, both in method and app., and the conclusion is reached that the $CHCl_2.CHCl_2$ method affords a reasonably accurate means for the detn. of porosity, especially useful for rapid work.
C. L. COOPER

The effect of flooding oil sands with alkaline solutions. R. C. BECKSTROM AND F. M. VAN TUYL. *Bull. Am. Assocn. Petroleum Geol.* **11**, No. 3(1927).—This paper gives the results of a series of expts. on the flooding of oil sands with ordinary water and solns. of various kinds and concns. The most satisfactory results were obtained by the use of dil. alk. solns. of salts of the weak acids and strong bases, Na_2CO_3 being the most effective of all. Several types of app. were employed, including in one series of expts. blocks of Dakota sandstone, which, after being charged with oil under pressure, were subjected to flooding tests.
C. L. COOPER

Viscosity determinations on less than 200 cc. of oil. L. BLOCH AND A. DOBRYANSKII. *Neftyanoye Khozyaistvo* **12**, 554–7(1927); *Chem. Zentr.* **1927**, 1531.—The viscosity in Engler degrees is measured by the time of flow of 200 cc. of oil. In order to make possible the detn. on less than 200 cc. oil, and thus in less time, the following equation was developed for the relation between time of flow and vol.: $T/t = {}^1/_3[(800/v) - 1]$, in which T is the time of flow of 200 cc. and t the time of flow of v cc.
A. A. BOEHTLINGK

The problem of gasifying heavy oil and its modern solution. JOSEF SIMON. *Feuerungstech.* **15**, 313–5(1927).—The Hahn oil burner is described. The oil is heated to 300–350° with a metal bath. The vapors are mixed with highly superheated steam and burned in a Bunsen type burner. Something analogous to the water-gas reaction takes place, the flame being blue.
ERNEST W. THIELE

Sulfur compounds in transformer oil. E. FERBER. *Z. angew. Chem.* **41**, 680–2 (1928).—The complete removal of S from the heavier distillates of petroleum or lignite tar, which is necessary before hydrogenation, is effected by treatment with metallic Na. The carbonaceous residue was acidified with dilute HCl and extd. with light petroleum, from which a yellow oil was obtained by evapn. This proved to be a mixt. of disulfides, from which, by reduction, amyl, heptyl and octyl mercaptans were isolated.
B. C. A.

The stability of transformer oils. A. R. MATTHIS. *Chimie et industrie* Special No., 324–7(April, 1928).—See *C. A.* **22**, 1467.
A. PAPINEAU-COUTURE

Moisture in oils used in the electrotechnic industry. Rapid method for the approximate determination of their moisture content. A. R. MATTHIS. *Chimie et industrie* Special No., 328–32(April, 1928).—See *C. A.* 21, 1882. A. P.-C.

A study of the pyrogenation of mineral oils. G. DIXMIER. *Chimie et industrie* Special No., 283(April, 1928).—A no. of lubricating oils subjected to Conradson's test gave results varying from 0.11 to 2%. The same oils subjected to 50-hr. tests in airplane motors did not show differences in the fouling of the motors having nearly as large a ratio as 1:20. Promising results have been obtained in developing a test based on heating the oil 150 hrs. at 150° and detg. the residue insol. in low-boiling petrolic ether. A. PAPINEAU-COUTURE

A study of the sulfuric acid reaction of mineral oils. M. CORNET. *Chimie et industrie* Special No., 281–2(April, 1928).—The H_2SO_4 test of mineral oils (dissolving 50 cc. of oil in 50 cc. benzine, agitating with 10 cc. concd. H_2SO_4, letting stand and noting the increase in vol. of the acid layer) was introduced on account of the notion that it gave a measure of the tendency to formation of tarry matter when the oil is used in motors. An attempt was made to det. if possible the amt. of polymerization taking place in the test (by detg. the mol. wt. cryoscopically before and after the test) and also to ascertain what changes, if any, take place in the nature of the hydrocarbons (by detg. the crit. soln. temp. in $PhNH_2$). On treating various oils with 40% H_2SO_4 (on the amt. of oil) at 20° and at 100° the changes in mol. wt. were so small as to be without significance. When the oils were treated with H_2SO_4 in the cold there was no appreciable change in the crit. soln. temp.; but at 100° there was a noticeable increase in the crit. soln. temp. Oils which were heated in absence of H_2SO_4 showed no change in crit. soln. temp. C. concludes that there is no relationship between the H_2SO_4 test and the action of heat in the motor on the oil; and this conclusion is further strengthened by the fact that oil can be subjected to the H_2SO_4 test, purified, and repeatedly treated in the same way, the results being practically the same each time. A. PAPINEAU-COUTURE

The distillation of shale oil from a liquid phase. I. II. ERNST VON PEZOLD. *Chem.-Ztg.* 52, 541–2, 562–4(1928).—P. reviews previous work in which oil shale was heated in the presence of a solvent. In his expts., P. uses shale oil as a solvent, and concludes that this increases the yield of oil materially. G. CALINGAERT

Working up turbine distillate for white oil. S. A. NAZAROV. *Neftyanoye Khozyaistvo* 14, 772–4(1928).—Turbine oil distillate was treated 12 times in succession with small portions of H_2SO_4 (contg. 20% free SO_3) at low temp., neutralized with 4.5° Bé. NaOH, treated with fuller's earth and pressed at a temp. of 70°. In this treatment the d_{15}^{15} decreased from 0.89362 to 0.87276, the flash point increased from 184° to 187°, the I no. decreased from 1.643 to 0, the sludge from 4.8% to 0, the abs. viscosity from 0.563 to 0.409. The strong odor disappeared. Analyses are given of the sludge recovered from each of the H_2SO_4 treatments. The acid has polymerizing, drying, oxidizing and solvent action in the first portions and sulfonation action in the following treatments. The amount of acid used was 1.6% by wt. for the first treatment and increased gradually to 6.57% calcd. on the amount of oil left for the 12th treatment. The loss in oil was 3.98% for the first treatment and 0.3% for the last. After the seventh or eighth treatment the change in the quality of the distillate was hardly noticeable. The acid sludge especially from the last treatments can be successfully applied for treatment of cylinder and machine oils. A. A. BOEHTLINGK

Construction and operation of oil stills. L. A. MEHLER. *Fuels and Furnaces* 6, 1073–7(1928).—Various types of conduction and radiant-heat stills are described, with diagrams, and their methods of operation, together with the limitations of each kind of still, are considered in this paper. Formulas used by the combustion engineer in calcg. the quantity of heat transmitted to the still and recirculating ratios for economy in operation are given. J. W. SHIPLEY

The use of tallöl (liquid rosin) in the alkali wash of petroleum distillates. K. DITTLER. *Chem.-Ztg.* 52, 577–8(1928).—Tallöl (Wastoil, liquid rosin) is a by-product of the cellulose industry. It is obtained in Scandinavia by treating rosin-rich conifer wood with 10 Bé. NaOH, and hydrolyzing the soaps obtained by mineral acids. A typical dry product showed: acid no. 157.3, sapon. no. 167.9, I no. 115, fatty acids 48.5%, rosin acids 43.3%, unsaponifiable matter 8.2%. Its odor precludes its use in making soft soaps. It is a good substitute for oleic acid to prevent the formation of emulsion in the alkali wash of petroleum distillates. The best results are obtained with 3 to 5 Bé. NaOH. Mix well, heat with indirect steam to at least 85°, and draw the clear soln. after 12 hrs. of settling. The oils refined with this soln. may take a brownish coloration, but they are clear and stable. G. CALINGAERT

Study of two gasolines with high olefin-hydrocarbon content obtained by distillation of coal and of shale. R. Garnaud. *Chimie et industrie* Special No., 275–6(April, 1928).—The detn. of olefins by treatment with cold concd. H_2SO_4 as it is generally carried out is very inaccurate with high olefin contents, because the olefins undergo considerable polymerization and the polymers dissolve in the hydrocarbons which were not attacked by the H_2SO_4. G. modified the method by sepg. the unattacked residue and distg. to the same temp. as the end point of the distn. of the original gasoline, the dissolved polymers being less volatile. Comparative detns. on an aviation gasoline produced from shale oil gave 28% olefins by the ordinary method and 71% by G.'s modification, the latter agreeing fairly well with the Br no. detn. (107, equiv. to 65.5% olefins calcd. as heptylene). The 2 gasolines examd. contained a certain amt. of diolefins, which tend to polymerize in use in the motor, but which lab. tests showed could easily be removed by filtration through fullers' earth. A. P.-C.

Tension of benzine vapors. I. M. Polzik. Izvestiya Teplotek. Inst. *Bull. Inst. Fuel Research* (Russia) **1927**, No. 4, 1–13.—The static method of detn. of vapor tension in benzine indicates the necessity of considering not only the liquid present whose vapors sat. the space but also the proportion of vols. between the liquid and vapor phases. A new factor is introduced in the equation of Stanley Lewis, which is changed into $P = f(T, m_1, m_2, m_3, \ldots\ldots v_1/v_v)$, where T is the abs. temp., m_1, m_2, m_3, ... are mol. quantities of each component in the liquid phase and v_1/v_v is the proportion between the vols. of the liquid and vapor phases. Narrow benzine fractions do not indicate this dependency. A. A. Boehtlingk

Anti-knock compounds and the adiabatic ignition of hydrocarbons. André Pignot. *Chimie et industrie* Special No., 277–8(April, 1928); cf. Aubert, P. and Villey, *C. A.* **22,** 863. A. Papineau-Couture

The influence of tetraethyl lead on the detonation of gaseous air-fuel mixtures. R Duchêne. *Compt. rend.* **187,** 200–1(1928); cf. *C. A.* **22,** 1476.—Further explosion expts. are run on gaseous C_6H_{14}-air mixts. at 80°, alone and with the addn. of 5% $PbEt_4$ to the C_6H_{14}. The photographic record of the propagation of detonation in the absence of $PbEt_4$ is weakened or no longer present when $PbEt_4$ is added. This demonstrates the anti-knock effect of $PbEt_4$ in homogeneous gas mixts. G. C.

The problem of detonation in explosion motors. E. Pistolesi. *Ann. scuola ing. Padova* **3,** 386–92(1927).—Callendar's nuclear theory and Smith's theory of pyrophoric effect are suggestive. By thermodynamic analysis the influence of the rate of compression and of the initial temp. of the mixt. on detonation can be evaluated. It shows that an increase of the rate of compression and of the initial temp. increases the mass of unburned mixt. which detonates under the compression of the burned fraction. It can be assumed that above a certain increase of the detonating mass the effect of detonation will attenuate itself, and the max. effect will take place when the detonating portion is about 50%. This would indicate that the temp. and compn. should be increased decidedly except for the danger of self-ignition. Therefore, the best conditions to avoid self-ignition increase the dangers of detonation. A. W. C.

The formolite reaction. A. Dobryanskii. *Neftyanoye Khozyaistvo* **12,** 57–64 (1927); *Chem. Zentr.* [II], **1927,** 1530.—The formolite reaction was systematically investigated to det. the source of trouble in formolite tests. Methylal was taken to replace the commercial aldehyde, which varies greatly in concn. A soln. of benzene in benzine was used as aromatic. The following items were investigated: (1) The concn. of H_2SO_4. Tests were made with 6.6 cc. methylal and 10 cc. of H_2SO_4 on 1 g. benzene in 9 cc. benzine. The formolite number increased from 2.8 with 85.6% H_2SO_4 to 126.9 with 93.0% H_2SO_4. (2) Duration of the reaction. The highest and stable formolite number is obtained in 10 min. by using the following proportions: 1 g. benzene + 9 cc. benzine + 7.5 cc. 93.6% H_2SO_4 + 5 cc. methylal. (3) The quantity of H_2SO_4. If 1 g. methylal is used for 1 g. benzene, the highest formolite no. unchanged by the addn. of H_2SO_4 is obtained with approx. 6–8 cc. of H_2SO_4. This is the max. of H_2SO_4 when for 1 g. benzene 2, 3, or 4 cc. methylal is used; an excess of H_2SO_4 is harmful in this case. (4) The best proportion of methylal and H_2SO_4 is 1.5 vol. H_2SO_4:1 vol methylal. (5) The formolite number is independent of the amount of the above optimal mixt. if more than 10 cc. is taken for 1 g. benzene; the formolite number appears smaller in smaller quantities of mixt. The formolite pptn. is qual. different if the quantity of mixt. is considerably below the requirement; an oil with diphenyl odor is then formed. D. gives the name α-formolite to this condensation product; the d[illegible] product which is obtained through treatment with H_2SO_4 in excess and which becomes horn-like when dry is called γ-formolite; and the substance formed under optimal conditions is called β-formolite. (6) The concn. of benzene in benzine should

not be below 10%. In detg. the formolite number of hydrocarbons difficultly sol. in benzine the methylal and H_2SO_4 treatment should be repeated. A. A. B.

The formolite reaction. A. Dobryanskii and M. Olevskii. *Neftyanoe Khozyaistvo* **12,** 227-31(1927); *Chem. Zentr.* [II], **1927,** 1530-1; cf. preceding abstr.—A similar investigation was made with a 40% soln. of CH_2O instead of methylal. The results were not so accurate. If formalin is added first to benzene in benzine and the H_2SO_4 later, much less formolite is formed than when the H_2SO_4 is added first. All observations below were made according to the last method. (1) With 8 cc. 10% benzene solution + 16 cc. H_2SO_4, the highest formolite yield is with 6% formalin. (2) With 10 cc. benzene soln. + 5 cc. formalin the highest yield is obtained at about 20 cc. of H_2SO_4; but the yield is affected very little by excess of H_2SO_4. (3) With 1 cc. of 79% benzene soln. and 1 vol. formalin to 4 vols. H_2SO_4 in the reagent, the max. of the reagent is 20 cc. For 1 vol. formalin to 3 vols. H_2SO_4, the max. in reagent is about 30 cc.; for 1:2.5 the max. is about 25 cc. The highest formolite number was obtained with the proportion 1:3. (4) With 7 cc. formalin and 21 cc. H_2SO_4 the highest formolite number is obtained with 2.6 g. benzene. It was found to be 124 for these optimal conditions; *i. e.,* it agrees in this case with the most favorable numbers obtained when methylal is used. One mol. benzene is required for 3 mols. of HCHO in the optimal mixt.; the wt. of the product formed (124 parts from 100 parts benzene) is considerably smaller than corresponds to the expression $C_6H_6 + 3CH_2O - 3H_2O$. A part of HCHO was evidently used always for side reactions. The high sensibility of the formolite number against the amount and concn. of the aromatic hydrocarbons makes the detn. of aromatic hydrocarbons in unknown mixts. problematical. The formolite number can at best be used only for comparisons. A. A. Boehtlingk

Insulating oils. G. Stadnikov and Z. Vozzinskii. *Neftyanoe Khozyaistvo* **12,** 694-6(1927); *Chem. Zentr.* [II], **1927,** 1915.—The sludge formed in transformer oils has its origin in the condensation of oxidation products formed from the oil. This condensation is greatly favored by naphthenesulfonic acids. The formation of sludge is frequently accompanied by a decrease in acidity of oil due to the condensation of acids; the decompn. of oil could not be measured by its acidity for this reason. Proofs of the condensing action of the naphthenesulfonic acids: When refined solar oil is heated with AcOH and cyclohexanol in a CO_2 atm. only esterification takes place if naphthenesulfonic acids are absent. In the presence of naphthenesulfonic acids sludge is also pptd. Sludge is formed by AcOH without alc. in the presence of naphthenesulfonic acids; also from acids with ketones and aldehydes. A light yellow oxidation product is obtained if air is led through transformer oil at 160° in the presence of a Cu gauze. The acidity of oil when heated with naphthenesulfonic acids is decreased, forming sludge. Naphthenesulfonic acids can be detected by this condensation method. The AcOH becomes colored when oil is heated with 4% AcOH and 2% AcOH (a part of the AcOH must remain undissolved); the intensity of color depends on the amount of naphthenesulfonic acids present in the oil. No darkening was observed in pure oil heated at 100° for 18 hrs. A. A. Boehtlingk

Oxidation of insulating oils. N. A. Butkov. *Izvestiya Teplotech. Inst.* (*Bull. Inst. Fuel Research* (Russia)) 1927, No. 4, 37-40.—B. reviews the work done by other authors and himself. The high oxidation of mineral oils is explained by catalysis. Catalytic oxidizing agents can be metals, soaps and org. compds. (autoxidants). Stadnikov's theory is criticized (*C. A.* **20,** 2634). A bomb, enameled on the inside and provided with a pressure gage, was charged with 10 cc. of oils of various origins and O at 14 atm. This app. was heated from 3 to 5 hr. up to 150°. Anti-oxidants such as β-naphthol and β-naphthylamine proved to be very effective. The formation of CO_2 and CO was observed and detd. either analytically or by calcn. from the increase in pressure. The following detns. were made in the oils after the expt.: acidity, sapon. value, excise resins, sediment formed by treatment with Na_2O_2. Highly refined oils are unstable toward oxidation, particularly oils treated with fuming acid. Unrefined oils are more resistant to oxidation. Refined oils when mixed with unrefined distillate of the same oil (25%) become more stable. The oxidation processes in oils are divided into: (1) Oxidation of impurities present (sludge, unsatd. hydrocarbons, etc.). The oil becomes stable if they are removed. (2) Oxidation of the oil hydrocarbons. Under the best conditions such oxidation is very slow; the rate depends on the structure of the oil hydrocarbons. Transformer oils can be oxidized faster by catalytic action. A. A. B.

The direct current conductivity of insulating oils. D. H. Black. *Phil. Mag.* [7], **6,** 369-84(1928).—A theory is put forward to account for the absorption current in liquid dielectrics. It is assumed that contact resistances are formed at one or both

electrodes by the passage of an elec. current, this causing the well-known decay of current with the time the potential has been applied across the electrodes. Exptl. support of the theory is given, and it seems capable of explaining in a simple manner the anomalous cond. phenomena observed in liquid dielectrics under direct current stresses. GEORGE GLOCKLER

Reviews of colloid technic. IV. Lubrication. C. WALTHER. *Kolloid Z.* **45**, 374–8(1928).—A review covering the various theories and formulas propounded in recent years (21 references) and the technical developments in the field of lubrication (19 references). G. CALINGAERT

Tar-formation number and stability of lubricating oils. BAUM. *Erdöl u. Teer* **4**, 423(1928).—It is contended that the tar-formation no., by the sepn. method, which shows the alteration of the oil on heating with passage of O_2 through it, is no criterion of stability in use because it does not take into account the catalytic effect of the metals present in the bearing, which may greatly predominate over the effects of heat and O_2 alone. The increases in the tar-formation nos. of various oils, after periods of use, showed great variation and were out of all relation to the original nos. The method is further objected to on the ground that it requires too long a time. The sp. gr., acid and sapon. nos. and H_2SO_4 reaction are claimed to be sufficient for characterization and the tar no. of Kissling, which can be detd. in a few minutes, for the detn. of the tarry constituents, if desired. F. S. GRANGER

Detection of paraffin in ceresin. D. HOLDE AND K. H. SCHÜNEMANN. *Z. angew. Chem.* **41**, 368–75(1928).—Wax-like products from Polish and Caucasian ozokerite, consisting chiefly of isoparaffins, are refined with H_2SO_4 and worked up as ceresin. Paraffin is frequently added to a ceresin, and this addn. was usually detected by fractional pptn. with alc. from chloroform soln., the fractions being examd. in a refractometer; the *n* of a ceresin is higher than that of a paraffin. A no. of samples of ceresin, m. 60–87°, and of paraffins which may be mixed with them, m. 50–60°, have been examd. and it is found that the latter are less easily pptd. from soln. and have much lower *n*s except in the single case of a Rangoon paraffin. The sp. gr. of paraffins is 0.867–0.915, and of ceresins 0.912–0.943; molten paraffins are less viscous than ceresins. Treatment with chlorosulfonic acid or 30% fuming H_2SO_4 provides still further distinction, as the extent of reaction is small with paraffins, but may involve up to 70% of a ceresin. Examn. of mixts. of pure ceresin with known amts. of different paraffins showed that treatment with acids combined with pptn. from soln. provided the most sensitive test for detection of added paraffin. B. C. A.

Automatic constant-temperature bath for asphalt tests. C. W. BETZ. *Eng. News-Record* **101**, 242–3(1928).—An illustrated description of an automatic electrically controlled circulating system in use in the lab. of the Bur. of Tests and Specifications, County of Allegheny, Pittsburgh, Pa., which regulates the temp. of water to within 0.1°. R. E. THOMPSON

Action of catalyzers on the distillation of wood. G. DUPONT AND R. LASCAUD. *Chimie et industrie* **Special No.**, 284–8(April, 1928).—See *C. A.* **21**, 3739. A. P.-C.

A practical wood-coking furnace. ANON. *Feuerungstechnik* **15**, 320–1(1927).—The retort described is wrought iron, vertical, larger toward the bottom, and externally fired. It is not continuous; tar appears to be the only by-product. E. W. T.

Centrifugal mixers [for acid treatment of crude oils] (BUHTZ) 1. The propagation of combustion in mixtures of hydrocarbons and air (DUCHÊNE) 24. Identification of oil field waters by chemical analysis (REISTLE) 14. Attack of cotton by mineral oils at higher temperatures (STÄGER) 25. C compounds of the magma (HELLMERS) 8. Radiometric exploration of oil deposits (BOGOIAVLENSKY) 3. Determining absolute viscosity of paraffin oils, lubricating oils, etc. (RAASCHOU) 2. The negative catalysis of autoxidation-antioxygenic activity (MOUREU, DUFRAISSE) 2. Filter for petroleum (U. S. pat. 1,684,025) 1.

DUNSTAN, A. E.: **The Scientific Foundations of the Refining of Petroleum.** Cantor Lectures. London: Royal Society of Arts. 95 pp. 3s.

Decolorizing, clarifying and purifying petroleum oils. HAROLD L. KAUFFMAN and IRWIN A. CLARK (to Harold L. Kauffman). U. S. 1,684,035, Sept. 11. The oil is mixed with finely ground filtering material such as fuller's earth and agitated with superheated steam; the mixt. is passed through a heating device with superheated steam slowly and without heating the oil above the b. p. of the oil being treated, the

mixt. is "steamed down" to a temp. somewhat above 100°, further cooled, and the filtering material is then sepd. from the oil. An app. is described. Cf. *C. A.* **21**, 3126.

Cracking hydrocarbon oil. GUSTAV EGLOFF (to Universal Oil Products Co.). U. S. 1,682,742, Sept. 4. Oil is passed through a heating coil into an expansion chamber which is connected with a dephlegmator; agitating fans are positioned in the upper portion of the vapor chamber; the dephlegmator is connected to a condenser, and the app. is maintained under superatm. pressure. Cf. *C. A.* **22**, 3772.

Apparatus for cracking hydrocarbon oils. ROBERT T. POLLOCK (to Universal Oil Products Co.). U. S. 1,683,801, Sept. 11. A dephlegmator is employed which is provided with partitions in a vertical cylindrical shell near the ends of the latter, forming upper and lower compartments and an intermediate compartment; a vapor inlet and vapor outlet communicate with the intermediate compartment and vertical tubes extend through the latter and connect the upper and lower compartments. The lower partition is provided with apertures through which the reflux condensate formed in the intermediate compartment can pass into the lower compartment. A cooling medium such as raw oil can be introduced into the upper compartment and can be withdrawn with the reflux condensate from the lower compartment. Other features of the app. are also described.

Apparatus for cracking oil. GUSTAV EGLOFF and WILLIAM R. HOWARD (to Universal Oil Products Co.). U. S. 1,683,766, Sept. 11. Pipes through which oil is passed and in which it is heated contain spiral agitating devices which are given a rotary movement by oil passing through the pipes. Each of these agitators is provided with a thrust bearing at the discharge end of the tube in which it is located.

Treating liquid residue from oil cracking processes. LYMAN C. HUFF (to Universal Oil Products Co.). U. S. 1,683,826, Sept. 11. Residual oil is withdrawn from a pressure cracking still while at a temp. above 200°, the pressure on it is lowered and it is introduced into an enlarged chamber from which evolved vapors are taken off and in which a body of the heated oil is maintained; the oil is continuously circulated in a closed cycle and regulated quantities of the hot oil are withdrawn from the cycle and used in furnaces as fuel.

Treating residue from oil-cracking operations. GUSTAV EGLOFF (to Universal Oil Products Co.). U. S. 1,683,767, Sept. 11. Residual oil contg. C in suspension which will not readily settle out on standing is centrifuged to ppt. the C particles after mixing the material with a distillate or other suitable hydrocarbon material of lower b. p. than the residual oil to lower the viscosity. The treatment is effected at a temp. below 95°.

Hydrocarbon still. WARREN K. LEWIS and NATHANIEL E. LOOMIS (to The Standard Oil Development Co.). Can. 283,093, Sept. 4, 1928. A still has two sets of connected coils for the stock, one set heated by radiant heat from a checker brickwork arch and the other by contact with products of combustion.

Refining hydrocarbon oils. SIJBREN TIJMSTRA (to Roxana Petroleum Corp.). U. S. 1,684,159, Sept. 11. Oils such as cracked oils are treated with a "doctor soln." and there is then added to the treated oil an aq. soln. of Na polysulfide or other suitable polysulfide capable of releasing free S and pptg. Pb from the oil.

Distilling oil from shales or coal. R. H. CROZIER. Brit. 283,639, Oct. 13, 1926. The material is heated at the upper end of a vertical retort to a high initial temp. (at least 400°) to volatilize pitch-like constituents and the heating of the semi-coke thus formed is maintained as the charge descends in the retort. A retort and vapor trap construction is described.

Treating oil shales and other bituminous materials. WILLIAM W. BLAISDELL. U. S. 1,684,007, Sept. 11. The material is preheated to a point somewhat below that at which the hydrocarbon vapors are formed and subsequently superheated to form such vapors in a sep. chamber of an app. which is described. The heat of the exhaust gases from the superheating chamber is used for the preheating after admixt. with atm. air to reduce their temp. The material is mechanically agitated in the preheating chamber and is passed to the superheating chamber without permitting escape of vapors.

Apparatus for treating oil. GEORGE C. KELLEY. Can. 283,501, Sept. 25, 1928. Oils having present various proportions of emulsions and water in suspension are treated by a preliminary heating in this app. to facilitate the sepn. of the water without increasing the emulsion, and the oils are confined in passages which are completely filled and so prevent foaming and ebullition during the time the oil receives its max. heat treatment.

Drying oil for electric transformers, etc. ALLGEMEINE ELEKTRICITÄTS-GES. (to International General Electric Co.). Brit. 283,592, Jan. 15, 1927. Oil for elec. trans-

formers or other insulating purposes is dried by contact with silica gel, a "bleaching earth" or other adsorbent of water, and is preferably maintained in contact with the adsorbent in the transformer or other app. during storage and transport.

Distributing pipe system, etc., for "routing" oil fractions or other materials undergoing fractional distillation. FRANCIS M. HESS. U. S. 1,683,778, Sept. 11.

Distillation apparatus for reclaiming oil from crank-case drainings, etc. ARNOLD L. HENNY. U. S. 1,684,270, Sept. 11.

Oil gas. CONSTANTIN CHILOWSKY. Can. 282,409, Aug. 14, 1928. Heavy oils are converted into non-condensable gaseous products with a minimum of liquid or condensable products, by atomizing the heavy oil, heating it to 700–1100° and passing the vapors over a catalyst heated to incandescence. The catalyzer is either a refractory, as Al_2O_3 or MgO, or metallic as Ni, Fe, non-rusting alloys and steel. Cf. *C. A.* 22, 1673.

Gasoline. EUGENE H. LESLIE and EDWIN M. BAKER. Can. 282,747, Aug. 28, 1928. Natural-gas gasoline soln. in absorption oil is introduced into the lower part of a distg. column above the lower end, hot vapors of the absorption oil, previously exhausted of gasoline, are introduced at a rate sufficient substantially to exhaust said soln. of its gasoline content, the exhausted absorption oil is heated to generate more hot vapors, substantially all the vapors leaving the top of the column are condensed except wild hydrocarbons, a part of the condensate is refluxed to said column above where the soln. enters, and a liquid gasoline product is collected and withdrawn from said column at a place above where said soln. enters and below where the refluxed condensate enters.

Fabric for "breather bags" of gasoline storage tanks, etc. CLARENCE M. CARSON (to Goodyear Tire & Rubber Co.). U. S. 1,683,759, Sept. 11. Fabric is treated with a gas-tight coating of glue-glycerol mixt. or other suitable proteinous material contg. a softening agent, the coating is partially dried, the fabric is stretched on a frame, treated with Na alum, CH_2O, $K_2Cr_2O_7$ or other suitable tanning soln. and the drying is then completed.

Increasing the power yield of benzine as a motor fuel. HANS BORGE. Norw. 44,899, Feb. 27, 1928. A few percent of refined sperm oil is added to the benzine.

Extraction of oils from pitch and asphalt. HERMANN SUIDA. Austrian 108,697, Sept. 15, 1927. The pitch, etc., is fed through a sloping conduit in a gas generator and is heated by the generator gases surrounding the conduit, the vapors evolved from the pitch being withdrawn at the top of the conduit. The residual coke falls out of the conduit on to the grate of the generator.

Sulfonic acids from mineral oils. G. S. PETROV. Russ. 428, Sept. 15, 1924. Sulfonic acids are extd. with an aq. soln. of EtOH, MeOH or Me_2CO and this ext. is used over again to obtain a higher concn. of sulfonic acids in the solvent.

Sulfonic acids from acid sludge from mineral or similar oils. G. S. PETROV. Russ. 1,447, Sept. 15, 1924. Acid sludge is dild. with water in equal parts and heated in an autoclave for 3–4 hrs. at 20 atm. The oil layer is then distd. and the fractions obtained are sulfonated as usual.

Sulfonic acids. G. S. PETROV. Russ. 460, Sept. 15, 1924. Acid-treated oil distillates, mineral oils, paraffin wax or ceresin is sepd. from sludge taken up with water and treated with gasoline, CS_2 or a similar water-insol. compd. to sep. the hydrocarbons.

Lubricant. ERNEST EDGINGTON. Can. 282,618, Aug. 21, 1928. A lubricant contains 1 pint of raw linseed oil, 2 oz. of beeswax and 2 teaspoonfuls of coloring matter.

23—CELLULOSE AND PAPER

CARLETON E. CURRAN

Progress in the field of cellulose and wood-pulp manufacture in the last six years. ERIK HAGGLUND. Inst. für Holzchemie der Akadamie Åbo (Finnland). *Z. angew. Chem.* 41, 6–14(1928). E. H.

Isolation and detection of cellulose in peat. K. HESS AND V. KOMAREVSKII. *Z. angew. Chem.* 41, 541–2(1928).—A method for the isolation of cellulose from peat has been developed and applied to a sample of peat from the environs of Moscow. The air-dry material (8–10% of moisture) is extd. with ether (loss, 6%) and then with an alc.-benzene (1:2) mixt. (loss [bitumen], 10%). The extd. material is next shaken with 1% NaOH soln. until no more colored substances are removed (loss, 49%), and

then subjected several times to the alternate action of a dil. (0.3-1%) soln. of ClO_2 and 2% Na_2SO_3 soln. (loss, 23%). The white, fibrous residue is dissolved in cuprammonium hydroxide and cellulose pptd., after addn. of alc. with acetic acid. The cellulose is washed with dil. acetic acid, water, alc., and, finally, ether. The purity of the sample is detd. by measuring the rotatory power in cuprammonium hydroxide soln. or the rotatory power of the acetate in chloroform or pyridine-acetone soln. The present sample contained 10% of cellulose, calcd. on the air-dry material. Whenever possible the purity of the cellulose obtained should be confirmed. The failure of Odén and Lindberg (*C. A.* **20**, 3342) and Marcusson (*C. A.* **21**, 1784) to do this renders the results open to criticism. B. C. A.

The study of cellulose and cellulose acetates by means of x-rays. JEAN J. TRILLAT. *Rev. gén. colloïdes* **6**, 57-68, 89-95(1928).—See *C. A.* **22**, 3043. E. H.

Cellulose acetate and cellulose acetate rayon. WILHELM A. DYES. *Chem.-Ztg.* **52**, 554-6, 574, 590-1, 630-1, 651-2(1928).—This series of articles is a general review of the economic and commercial sides of the development of cellulose acetate and cellulose acetate rayon. The various patents in this connection are discussed.
FREDERICK C. HAHN

Benzoylcellulose. KATSUMOTO ATSUKI AND KICHIRO SHIMOYAMA. *Kunstseide* **10**, 250(1928); cf. *C. A.* **21**, 4062.—Regenerated or normal cellulose is treated with 35% NaOH soln. and aged for 24 hrs. at ordinary temp. The resulting alkali cellulose is treated with BzCl and benzene in the following ratios: $C_6H_{10}O_5$: NaOH : BzCl = 1 : 4 : 10, and the mixt. is heated 1-2 hrs. at 50-60° on the water bath. The reaction product is poured into water, and washed several times with a large vol. of hot water. The benzoylcellulose obtained was $C_6H_8O_3(BzO)_2$ contg. about 66% benzoate group. The product from regenerated cellulose is sol. in $CHCl_3$ and acetone, giving solns. of very low viscosity. The films obtained from these solns. were very brittle. The product from normal cellulose is not clearly sol. in $CHCl_3$, its soln. having a very high viscosity, and its films being brittle. The brittleness with regenerated cellulose is attributed to the degraded state of the cellulose, while with the normal cellulose it is attributed to imperfect dispersion of the benzoylcellulose in the solvent. FREDERICK C. HAHN

X-ray investigation of cellulose nitrate. R. O. HERZOG AND S. VON NÁRAY-SZABÓ. *Z. physik. Chem.* **130**, 616-25(1927).—The Debye-Scherrer diagrams given by specimens of cellulose nitrate prepd. in different ways and of different N content all exhibit the same interference. It is therefore concluded that the various cellulose nitrates are in reality mixts. of cellulose trinitrate and unchanged cellulose. Consideration of the kinetics of the nitration and of nitration in general favors the theory of the exclusive production of cellulose trinitrate. The latter belongs to the quadratic system, the lattice consts. being a = 14.75, b = 7.88 and c = 10.30 A. U. The elementary cell contains 4 mols. B. C. A.

Micro-method for the determination of the nitrogen content of nitrocellulose. Fractionation of nitrocellulose by diffusion. D. KRÜGER. *Z. angew. Chem.* **41**, 407-8 (1928).—A sample of nitrocellulose (5-10 mg.) is moistened with a small quantity of alc. and hydrolyzed by heating at 50-60° with 5 cc. of 30% NaOH soln. and 0.5 cc. of 30% H_2O_2 soln. until a clear soln. is obtained. The nitrate is then reduced to NH_3 by addn. of 10 cc. of 30% NaOH soln. and 0.25 g. of Devarda's alloy, and the NH_3 is steam-distd. into $N/70$ HCl, the excess of acid being titrated with standard NaOH soln. If a soln. of nitrocellulose in an org. solvent is allowed partially to diffuse into the pure solvent, it is found that a sepn. into 2 fractions of different phys. behavior and of different N content has taken place. B. C. A.

The chemistry and physics of artificial silk. R. O. HERZOG. Kaiser Wilhelm-Inst. für Faserstoffchemie. *Z. angew. Chem.* **41**, 531-6(1928). E. H.

Treating viscose rayon. LAMBECK. *Kunstseide* **10**, 115-6(1928).—A discussion is given of the essential features of the spinning-pot and of the spool methods for the manuf. of rayon. It is pointed out that plants using the spool method may offset some of the disadvantages of this process by introducing machines for twisting and reeling the thread while still wet. FREDERICK C. HAHN

Poisonous gases in a viscose rayon plant and their removal. JOHANN EGGERT. *Chem.-Ztg.* **52**, 505-6(1928).—A general discussion of the question of removing H_2S and Cl from the spinning and the bleaching app., resp. The drawbacks of various construction materials used for equipment for removing gases are discussed from the standpoints of corrosion and cost. A *corrosion-resisting material*, "Haveg," is especially recommended as a construction material in the foregoing cases. FREDERICK C. HAHN

The properties of silk coagulates made by pouring colloidal silk solutions into concentrated tannin solutions. P. P. VON WEIMARN. *Kolloid-Z.* **45**, 39-42(1928).—

The coagula made by pouring solns. of silk in aq. salt solns. (NaI) into 30 to 40% tannin soln. can be drawn out into glistening threads, but on drying they become very brittle. Most of the tannin can be washed out by prolonged boiling in water but the resulting threads are not stable. By washing in water, then in hot 9% soap soln. and finally in water, the tannin can be removed completely and stable threads produced. F. L. BROWNE

The preparation of stable threads from silk coagulates. P. P. VON VEIMARN. *Kolloid-Z.* **45**, 36–9(1928).—Glistening silk threads were made artificially by allowing very concd., viscous solns. of silk in aq. salt solns. (NaI or NaCNS) to flow in a fine stream into concd. solns. of coagulating salts (Na citrate or Na K tartrate) and then washing out the salts in boiling water. Some of the threads so prepd. remained unchanged after $1^1/_2$ yrs.; others became brittle. F. L. BROWNE

Chemistry and the press. ALBERT RANC. *Chimie et industrie* Special No., 101–8 (April, 1928).—An address bringing out the part played by chemistry in the production of modern newspapers. A. PAPINEAU-COUTURE

The use of tallöl in the alkali wash of petroleum distillates (DITTLER) 22. Tanning products derived from the manufacture of wood cellulose (ESCOURROU) 29. Composition and structure of the cell wall of wood (RITTER) 11D. Dispersoidological investigations. XVIII. The structure of cellulose fibers (VEIMARN, *et al.*) 2. Ac_2O [in acetylating cellulose] (Brit. pat. 283,781) 10. Boiling down liquids evolving volatile constituents (Ger. pat. 451,973) 13.

Cellulose. HERMAN BUBEC (to I. G. Farbenind. A.-G.). Can. 283,412, Sept. 18, 1928. Cellulose of high degree of purity is manufd. by first mercerizing the cellulose, and then treating with a NaOH soln. of 8 to 9% and finally washing the product free from alkali.

Cellulose. ARTHUR FRANZ (to I. G. Farbenind. A.-G.). Can. 283,573, Sept. 25, 1928. Cellulose is produced from vegetable material by treatment at temp. below 80° with a concd. soln. of a chlorate, more readily sol. in H_2O than $KClO_3$, and comprising spent lye of a previous operation in mixt. with a moderate quantity of HCl.

Cellulose product. OTTO C. STRICKER. Can. 282,455, Aug. 14, 1928. Cellulose is produced by the decompn. of vegetable fibers by the use of boiling solns. (lyes) consisting of a salt-like compd. of at least one sol. hydroxy compd. of the isocyclic series (phenols, cyclohexenol, hydrogenated phenols naphthols, hydrogenated naphthols, methylcyclohexanol, polyphenols, hydroxysulfones, sulfonic or carboxylic acids of above substances, functional derivs. of phenols or its homologs), with a metal (alkali group, certain of the alk. earth metals and metals of the magnesium group are suitable) which replaces at least one H atom of the hydroxy compd.

Manufacture of cellulose. AKTIESELSKAPET RAOUL PICTET & F. THARALDSEN. Norw. 43,950, April 19, 1927. An addn. to Norw. 42,934 (*C. A.* **21**, 2188) regarding the manuf. of cellulose by treating cellulose-contg. materials with an aq. soln. of SO_2. The boiling process is carried out under a pressure of at least 8 atm. During one or more periods of the boiling the temp. is kept partly below, partly above 110°.

Boiling cellulose. EINAR MORTERUD. Norw. 44,543, Oct. 24, 1927. When a cooking is finished, before the digester is emptied, a part of the hot liquid is blown over into a second digester filled with raw chips, the discharged amt. of hot liquor in the first digester being immediately replaced by an equal amt. of cold used liquid of nearly the same concn.

Heating the liquid in cellulose digesters. AKTIESELSKAPET RAOUL PICTET & F. THARALDSEN. Norw. 44,363, Aug. 29, 1927. A part of the liquid is taken out from the filled digester and heated and eventually evapd. in a sep. heating app. The mixt. of gas and steam is blown directly into the same or another digester. The evapd. liquid may also be returned into the same or another digester.

Letting off the pressure from cellulose digesters. EINAR MORTERUD. Norw. 44,111, June 7, 1927. Mech. features of the procedure intended to reduce the time required for letting off the steam pressure from the boilers while the heat of the escaping steam is utilized as completely as possible.

Treating cellulose and similar materials with chlorine. H. HJORTH. Norw. 44,087, May 30, 1927. Cellulose and similar materials in the form of a half solid mass contg. about 30% of dry matter are in thin layers subjected to the action of Cl gas partly under free fall through the Cl gas in a cylindrical (vertical) app. with rotary axle, under reduced pressure. The Cl gas is introduced at a considerable distance above the outlet for the treated materials in the bottom of the app.

Composition for treating cellulose sheets. CHARLES R. FELIX. Can. 282,965, Sept. 4, 1928. The compn. specified contains 72 g. Na_2CO_3, 1 qt. of liquid Na silicate soln. 40° Bé., 46 g. Na tungstate and 2 gallons of water. Cf. *C. A.* **21,** 3743.

Cellulose ester. HEINRICH HEINMANN and ALFONS BAYERL (to I. G. Farbenind. A.-G.). Can. 283,266, Sept. 11, 1928. Cotton to be esterified is first treated with formic acid of 85% strength. Cf. *C. A.* **21,** 3742; **22,** 164.

Cellulose ether. LEON LILIENFELD. U. S. 1,683,831, Sept. 11. Low-alkali-content and low-water-content alkali cellulose contg. not over 50 parts each of alkali and water per 100 parts cellulose is treated with etherifying agents such as alkyl sulfates or halides and caustic alkalies and etherifying agents are allowed to act on the intermediate formed. The products obtained are suitable for making films, etc.

Cellulose ethers and alkali cellulose. LEON LILIENFELD. U. S. 1,683,681, Sept. 11. An alkali cellulose of low water content suitable for alkylation or aralkylation is prepd. by treating an alkali cellulose obtained by evapg. water from an alkali cellulose contg. more water than alkali, with solid caustic alkalies. U. S. 1,683,682 specifies drying the material at a temp. below 18°, in prepg. alkali celluloses of low water content by drying watery alkali celluloses.

Cellulose nitroacetates and similar esters. I. G. FARBENIND. A.-G. Brit. 283,595, Jan. 15, 1927. Manuf. of nitric acid-aliphatic acid esters of cellulose is so conducted that during the esterifying process the cellulosic material is exposed in such a form to the action of the HNO_3 that the nitration proceeds of itself rapidly and uniformly. *E. g.*, cotton may be first partly esterified by Ac_2O in the presence of H_2SO_4 and HOAc, with subsequent addn. of HNO_3. Various other alternative procedures of similar character are also described.

Celluloid. EMIL G. JOHNSON. Can. 283,499, Sept. 25, 1928. Celluloid is rendered pliable for molding by suspending it in an air-tight chamber and subjecting it to the fumes of acetone or other suitable solvent, to soften said material, then molding the material and subjecting it to oven heat.

Sulfate cellulose boiling liquid. TORBJÖRN N. M. MOLIN. Norw. 44,412, Sept. 26, 1927. Dil. boiling liquid, soda soln. or water after addn. of CaO is carried continuously through a series (2 or more) of dissolving vessels where the fused mass from the soda furnaces is introduced in continuous current. Before entering into this process the boiling liquid may be used for impregnating the raw chips, a treatment which has been found to further the economy of the sulfate cellulose process.

Recovery of acetic acid from cellulose acetate solutions. SOCIETE CHIMIQUE DES USINES DU RHÔNE. Ger. 462,994, June 28, 1928. See Brit. 266,684 (*C. A.* **22,** 597).

Concentrated acetic acid from solutions of cellulose acetate in acetic acid. VEREIN FÜR CHEM. IND. A.-G. (Eduard Löw, inventor). Ger. 463,871, July 19, 1928. The AcOH is driven out with a current of steam or dil. AcOH vapors at ordinary or reduced pressure. Cf. *C. A.* **22,** 1473.

Regeneration and utilization of sulfite cellulose waste liquor. WILHELM MICHAEL AND ALBERT PALM (to I. G. Farbenind. A.-G.). Can. 283,415, Sept. 18, 1928. In the process of producing cellulose by means of H_2SO_3 and NH_3, free H_2SO_3 is blown from the waste liquor, NH_3 and a catalytic material are added, the liquor is heated in a closed vessel to a temp. above 180°, C is filtered off, H_2SO_4 and $(CO_2H)_2$ are pptd. and filtered off, and the liquor is used again in a following pulping operation after introducing H_2SO_3. After repetition of these operations NH_4 salts of org. acids are recovered from the filter and liquor finally obtained.

Regulating flow of viscose. EZIO PENSOTTI. Austrian 108,692, Sept. 15, 1927. A pump for use in manufg. artificial silk from viscose is described.

Artificial silk. F. J. GAHLERT. Brit. 283,752, Feb. 10, 1927. See U. S. 1,666,090 (*C. A.* **22,** 2056).

Artificial silk. NORDDEUTSCHE VERWALTUNGS GES. Brit. 283,481, Jan. 10, 1927. To reduce the denier number of freshly prepd. artificial threads, the threads as produced by suitably modifying the coagulating process or by a sep. treatment to which the freshly spun threads are subjected, are stretched mechanically without being subjected to sliding friction, as by the use of a suitable set of rollers, and are dried under tension. The use of swelling agents and numerous other details of procedure are described.

Fine threads of viscose silk. LAMBERTUS ALEXANDER VAN BERGEN. Dutch 18,391, July 16, 1928. Addn. of 1/2 to 2% of Zn or Al sulfate to the acid spinning bath (sulfuric acid + sulfate) allows spinning of very thin threads (6 and 3 deniers) without increase in acidity (4 to 5% acid).

Apparatus for producing artificial silk filaments by the stretch-spinning cupram-

monia process. J. P. Bemberg A.-G. Brit. 283,923, Jan. 20, 1927. Threads during their treatment with acid in channeled devices or troughs are led through guides (which may be formed of acid-resisting steel) adjustably positioned within the troughs, by which the grain of structure of the finished threads can be controlled.

Feeding wood chips to a digester. George H. Tomlinson. Can. 282,665, Aug. 21, 1928. The hot liquor blown from a digester with a cooked charge is sepd. from the charge and redirected to the top of the digester and simultaneously fed thereinto with the wood chips for a second charge, thereby soaking and preheating and closely packing the wood chips in the digester.

Agitating and washing fibrous pulp in a series of separate baths. Charles A. Johnson (to Brown Co.). U. S. 1,683,782, Sept. 11. Mech. features.

Sulfite pulp. George H. Tomlinson. Can. 282,834, Aug. 28, 1928. A charge of wood chips is preheated in a digester to a temp. of approx. 100° by means of hot liquor discharged with the cooked pulp in a previous digesting operation, a charge of cooking acid is preheated in another container to a temp. approx. 100° by means of hot gases obtained as the result of a previous digesting operation, the two preheated materials are brought together in a digester in such a manner as to maintain approx. the same temp. between the chips and cooking acid, and then steam is introduced into the mass to complete the cooking operation. Cf. *C. A.* **22,** 1041.

Apparatus for manufacture of sulfite pulp. Lemuel B. Decker. Can. 283,384, Sept. 18, 1928.

Recovery of waste gases in sulfite pulp manufacture. George A. Richter (to Brown Co.). U. S. 1,683,628, Sept. 11. In recovering SO_2 from hot blow-pit vapors and gases, the latter are conducted through spiral brick or other suitable confined inert interstitial material in counter-current flow to cold acidulated water, so that vapors are condensed and the gases are cooled; the cooled gases are then led through another mass of interstitial material in contact with water to effect absorption of SO_2; the acidulated water for the first-mentioned treatment is supplied from the second stage of the process and the SO_2 liberated in the first stage may be reused in the pulp manuf.

Sulfite liquor. George A. Richter (to Brown Co.). Can. 283,024, Sept. 4, 1928. A cooking liquor for the production of pulp comprises H_2SO_3 soln. contg. $(NH_4)_2SO_4$ and sodium salts.

Regenerating spent sulfate liquors. Alfred H. White (to J. E. Alexander and E. G. Goodell, trustees). Can. 283,128, Sept. 4, 1928. The spent liquors obtained by the sulfate process for the manuf. of pulp are regenerated by concn. until the effective heating value of the liquor is more than sufficient to calcine a wt. of $CaCO_3$ equal to the wt. of the sol. inorg. salts in the liquor, burning the concd. liquor in air and in the presence of $CaCO_3$, whereby the $CaCO_3$ is converted into CaO, intimately mixing the CaO with the non-combustible residue of the liquor to form a solid product comprising largely CaO, alkali carbonates and sulfates, mixing said solid products while still above a red heat with carbonaceous matter sufficient to reduce the sulfates to sulfides, largely effecting such reduction at a temp. above 1100° F., and leaching the reduced mass with H_2O to dissolve alk. salts.

Tanning agent from sulfite cellulose waste liquor. Carl Hüttenes and Carl Peter Hüttenes. Ger. 451,913, Nov. 4, 1927. One cu. m. of sulfite cellulose liquor of 6.5° Bé. is neutralized with 7 kg. of CaO and heated to boiling. Twelve kg. of cryst. Na_2S is added and boiled for 45 min. The Na_2S added amounts to 10–12% of the dry content of the liquor. The resultant product is filtered and concd. to 24° Bé. The lime is pptd. with 1.55 kg. of 96% H_2SO_4 dild. with an equal quantity of H_2O and 9.6 kg. $Al_2(SO_4)_3$ dissolved in the same quantity of water. The above quantities of reagents are added to 100 l. of the filtrate. The lime ppts. as sulfate and is filtered off. The filtrate is further concd. to 30° Bé. It is then dried to a yellowish powder. Na_2SO_4, $NaHSO_4$, $Cr_2(SO_4)_3$ or $(NH_4)_2SO_4$ may replace the $Al_2(SO_4)_3$. In place of 12 kg. of Na_2S used above, 8 kg. of Na_2S and 4 kg. of NaOH may be used.

Derivative from ligninsulfonic acid. Anthony J. Hailwood (to British Dyestuffs Corp., Ltd.). Can. 282,677, Aug. 21, 1928. A new deriv. of ligninsulfonic acid (sulfite cellulose pitch) is obtained by treating at 110–120° under pressure with NH_3 soln. The new product is particularly suitable for addn. to dispersed *dye pastes* which are to be dried to powder form. It also finds application as *tanning agents*.

Paper pulp. B. Dorner (to Euromerican Cellulose Products Corp.). Brit. 283,851, Jan. 17, 1927. Materials such as corn stalks, straw, flax, esparto grass and the like are finely shredded, water-sol. constituents are extd. with a stream of hot or cold water (which may require 4–5 days). The liquor thus obtained may be evapd. to use in

stock feed or may be fermented to *produce alc.* The leached material is beaten and boiled in NaOH soln. at ordinary or increased pressure, using just enough alkali to react with the silica present. Pentosans may be recovered from the liquor thus produced. The partially cooked material is then further digested with NaOH and washed and bleached in the usual manner.

Paper pulp. EXECUTORS OF BARON CABLE, G. C. GODFREY, E. C. BENTHALL, E. S. TARLTON and H. F. WHEELER (TRADING AS BIRD & CO.) and E. SPENCER. Brit. 283,910, Jan. 20, 1927. In a semi-continuous process for producing cellulose or paper-pulp from material such as bamboo, grasses, wood or reeds in a cascade digestion system in a closed ring in which each digester is charged in turn (the stock in any one being then subjected to a series of treatments with caustic liquor or mixed caustic and sulfide or sulfite liquors, at successively increasing pressures and concns., followed by leaching and washing), the digesting liquor after use in any one digester is passed to the digester next-but-one lower in the cycle of operative sequence. The liquor may be blown over by steam pressure and made up with wash water to the desired vol. and concn. An app. is described. Brit. 283,911 specifies passing steam from a pulp digester in which the process is complete into another digester which is being or has been freshly charged to heat the charge and any assocd. liquor. An app. is described.

Beater for paper pulp. LORENZO M. AVENSON. U. S. 1,683,597, Sept. 11. **Treating paper pulp and other fibrous masses.** K. SVEEN. Norw. 44,095, June 7, 1927. In order to obtain a better agglomeration of the particles of paper mass and in order to further the sepn. from the liquid, relatively small quantities of dissolved or emulsified substances such as gelatin, glue, casein, rubber latex, soap, etc. are added to the suspension which already contains $Al_2(SO_4)_3$ or similar colloid-coagulating substances. A good working addn. is 0.1% of the total dry matter of glue in the form of a soln. which has been stored at 5–15° for a couple of days. It may be favorable to apply the glue together with some substance having the power of pptg. the glue colloid, for instance sulfite cellulose waste liquor.

Paper filter packs. HENRY S. HELE-SHAW and JOSEPH A. PICKARD. Can. 281,702, July 17, 1928. Paper filter packs are prepd. for edge filtration by treating the paper with any of the following substances, nitrocellulose, acetylcellulose, rubber, chlorinated rubber, celluloid, casein, cellulose esters, synthetic or natural resin, paraffin, hardened gelatin, asphaltum, bakelite and similar formaldehyde condensation products.

Transparent paper. O. KLOTZ. Brit. 283,751, Feb. 7, 1927. Paper such as pergamyn or parchment paper is rendered transparent and suitable for bags for edible articles by coating on one or both sides with gelatin soln. and drying.

Water-proofed paper. JAMES REID. Can. 282,444, Aug. 14, 1928. Close-grained paper is water-proofed without destroying its flexibility and strength by quickly passing the paper through a bath of mineral rubber (a bituminous product) 100 parts, scale wax 10 parts and Montan wax 2 parts, the mixt. being heated above 350° F. (say 450° F.), and quickly stripping the superfluous coating and lowering the temp. of the finished product. Cf. *C. A.* **22**, 3530.

De-inking solution. WILLIAM LEWIS. Can. 283,130, Sept. 4, 1928. A de-inking soln. for paper stock contains Na or K silicate, NaOH, pearline and water.

Ornamentation of paper surface. MICHEL RUDIE (to W. V. Dawson, Ltd.). Can. 283,047, Sept. 4, 1928. The surface of paper is ornamented by applying dyes of chemically repellent nature in contiguous relation and enabling the dyes to build up a border of heightened color outlining the division between the color areas and applying to said color areas a self-crystallizing compd. of metallic sulfates and preventing the crystn. at certain portions of the surface by previous chem. treatment.

24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNROE

Max von Duttenhofer. H. BRUNSWIG. *Z. ges. Schiess-Sprengstoffw.* **23**, 257–60 (1928).—A review of the contributions of D. to the *smokeless powder* industry, commemorating the 25th anniversary of his death. C. G. STORM

Further regarding liquid air explosives. C. BUNGE. *Z. ges. Schiess-Sprengstoffw.* **23**, 193–4(1928); cf. *C. A.* **22**, 2057, 3047.—Controversial, relative to dangers of use. C. G. STORM

The question of safety in use of liquid air explosives. F. W. WEDDING. *Z. ges. Schiess-Sprengstoffw.* **23**, 159–60(1928).—Prussian statistics are cited to show that

liquid air explosives used in mining are in no respect safer to use than the usual solid explosives. C. G. Storm

The new Hungarian Government powder factory in Füzíő. Franz Langenscheidt. *Z. ges. Schiess-Sprengstoffw.* **23**, 157–8(1928).—This factory, completed in May, 1927, comprises sep. units for the manuf. of *nitroglycerin, nitrocellulose,* military *smokeless powder* and *TNT*. The power plant is constructed underground in dolomite rock, so as to be bomb-proof and safe from air attack. Nitroglycerin is manufd. by the improved Nathan process. American type nitrators are used in the nitrocellulose plant, to obtain uniform nitration and freedom from nitrator fires. After centrifuging to remove the spent acid, the nitrocellulose is again covered with cooled H_2SO_4 in order to obtain more complete recovery of the HNO_3. TNT is made setting by the 2-stage nitration process, and recrystd. from H_2SO_4, yielding a product with setting of 80°, which may be increased to 80.3° by recrystn. from an org. solvent. C. G. S.

Blasting with liquid oxygen. M. Grunow. *Bautechnik* **6**, 412–7(1928).—Operating details are given. E. M. Symmes

The preparation of mixed acids (with particular reference to the explosives industry). von Bezold. *Z. ges. Schiess-Sprengstoffw.* **23**, 190–3(1928).—The mixing of strong HNO_3 and H_2SO_4 or oleum in various types of app. is described. Of special interest is an app. for this purpose in which neither compressed air nor mech. stirrers are used for mixing. The HNO_3 and H_2SO_4 are allowed to flow from weighing or measuring tanks, together with a stream of previously mixed acid, into a header terminating in a coil of "Azidur" immersed in a cooling tank. The uniform mixt. flows from the coil into a receiving tank, is pumped to an elevated storage tank from which it can flow through a cooler back to the mixing header. The process may be made continuous, and a capacity of about 5 tons per hr. may be obtained. C. G. S.

Miedziankit and its manufacture at Langelsheim am Harz. M. Winter. *Kali* **22**, 161–4, 181–4, 201–5, 226–9(1928).—This is a review of the history and manuf. of "Miedziankit," a chlorate explosive contg. $KClO_3$ 87%, *petroleum* 10% and beech wood flour 3%. This is stronger than saltpeter blasting powder but weaker than dynamite. Details are given of plant and building construction, power, water and steam supply and fire and lightning protection. Safety measures include mat surface window glass and tanks outside every door for quenching blazing clothing. The $KClO_3$, contg. less than 0.15% $KBrO_3$ and 0.05% H_2O, is dried, ground in a Gloria or a Matador mill, mixed with wood meal and cartridged. It is then satd. with a petroleum distillate (I) by dipping 3 times into pans contg. $^1/_3$ the total quantity required. I must have a flash point above 30° and a free acid content less than 0.075% (as H_2SO_4) and is freed from water by filtering through CaC_2. Paul J. Culhane

Apparatus for determining the ignition and explosion points of explosives. M. Kostevitch. *Z. ges. Schiess-Sprengstoffw.* **23**, 156–7(1928).—Two types of app. are illustrated and described. One for the detn. of the ignition temp. of such materials as *smokeless powders* is entirely of glass, 0.1 g. of sample being sealed in a 3.5-cc. glass bulb suspended near the bottom of a large test tube within a second larger tube, the latter being immersed in the liquid-heating bath. Thermometers are placed in the inner tube and in the bath. The glass app. aids in detecting the first signs of ignition. The app. for detn. of explosion point of *high explosives* is constructed of metal, the electrically heated bath being of Wood's metal. The sample is contained in a sealed glass bulb of 0.5-cc. capacity suspended in a metal tube within the bath. Detns. of the ignition temp. of Russian and German nitrocellulose smokeless powders 16 years old showed these powders to be in excellent condition and superior to other types of powders. C. G. Storm

Ignition temperature of aromatic nitro compounds. S. Micewicz and K. Majkowski. Officers' Engineering School (Warsaw.) *Przemysl Chem.* **12**, 197–214 (1928).—Detns. of ignition temps. of certain explosives according to the methods recommended by official specifications do not give a true value because the temp. of the bath in which the explosive is heated deviates widely from the temp. of that substance. Strong exothermic processes of decompn. were noticed in these investigations. These result in a higher temp. of the explosive than is recorded by the heating bath so that at a certain stage the flow of heat from the bath to the explosive reverses its direction. To avoid such complications app. must be so designed that the temp. will be measured right in the explosive material itself and not in the surrounding bath so that the smallest variations of temp. may be recorded. To make this possible the thermometer must have very low heat capacity. M. and M. used for the thermometer a Pt-Ir resistance wire 0.05 mm. diam. and 10–16 mm. long, soldered with Ag to Cu leads 1–1.5 sq. mm. and 25–30 cm. long. After igniting it the Pt-Ir wire would be

immersed in 1.2–1.5 g. of the molten sample held in a test tube 15 mm. diam. and 16 cm. long. This test tube would then be put in a bath of molten Wood's metal or oil, the temp. of which is measured with a Hg thermometer. For measuring changes of resistance of the Pt-Ir wire a modified form of Wheatstone's bridge was used. Each new piece of wire on soldering it with Ag had to be calibrated. With trinitrotoluene (I) and picric acid (II) violent variations of temp. took place after it became hotter than the bath, *i. e.*, a few seconds before the explosion. This was not observed with tetranitromethylaniline (III). I and II (but not III) reach a max. temp. during heating which is followed by a lowering of temp. and then the detonation. Because of the rapid and violent variation this temp. was not established. Detns. were made with the bath being heated at the rate of 5°/min. and 10° or 20°/min. The method of "sudden heating" which consists of suddenly immersing the test tube with the sample in a bath preheated to the right temp. gave consistent and good results because side reactions taking place during gradual heating of the explosive are then largely avoided. It is most important to establish a definite temp. to which the bath is to be preheated before the sample is plunged into it. The following results were obtained with this method: I 312–318°; II 337–346°; III 208–226°, depending on the temp. of the bath into which the sample is plunged. A. C. Zachlin

The use of firing machines and firing switches for high voltage current in mine blasting. Heyer. *Z. ges. Schiess-Sprengstoffw.* **23**, 185–9, 233–4(1928).—A description of various types of app. used for firing *mining explosives*, and methods of connecting shots. C. G. Storm

The electric firing of blasts with high voltage current in quarries. W. Borchers. *Z. ges. Schiess-Sprengstoffw.* **23**, 189–90(1928).—A discussion of safety precautions, etc. C. G. Storm

The propagation of combustion in mixtures of hydrocarbons and air. R. Duchêne. *Chimie et industrie* Special No., 279–80(April, 1928).—See *C. A.* **22**, 1476. A. P.-C.

Laws governing the combustion of colloidal powders. Henri Muraour. *Compt. rend.* **187**, 374–5(1928); cf. *C. A.* **22**, 1042.—It has been found that the area, $\int pdt$, expressed in kg. per sq. cm. per sec., is a characteristic of a burning powder which is practically independent of the cooling effect of the walls of the containing vessel, and of the density of loading. Assuming that the presence of another powder having a higher rate of combustion and a higher explosion temp. would accelerate the combustion of one of low rate of combustion and low explosion temp., tests were made, in a Vieille bomb, of the last-mentioned powder, alone, and of the same wts. of charge of it in admixt. with 50–75% of a powder having a very much higher rate of combustion and double the explosion temp., but the results for all were identical within the errors of expt. M. concludes that the total area, $\int pdt$, characteristic of a given powder, is not modified when there is substituted for a part of this powder a powder of different quickness, no matter what the temp. of the gas from the added powder may be, and he holds the simplest explanation to be that because of its continuous emission the gaseous mass which surrounds the powder grains cannot come into contact with the surface of the powder. This is therefore carried to its decompn. temp only by the layer of gas in contact with it and which it is itself emitting. Hence the gaseous mass which surrounds the grains of burning powder acts solely by its pressure and not by its temp. Charles E. Munroe

The duration and length of explosion flame from different explosives. H. Kast and H. Selle. *Z. ges. Schiess-Sprengstoffw.* **23**, 153–6(1928).—The usual methods were employed for obtaining photographs on both rotating and stationary films of the flame effect from the explosion of *TNT*, *Tetryl*, *guhr dynamite* and a no. of different types of German *coal-mining explosives*. With the latter the duration of flame was 0.0003 to 0.00035 sec. and the length 11 to 85 cm. For TNT, tetryl and guhr dynamite, resp., the duration was 0.020, 0.011 and 0.0045 sec., and the length 150, 150 and 85 cm. The coal-mining explosives showed only a primary flame, whereas TNT in particular showed 3 stages of flame, a primary flame of about 0.001 sec. duration, a weak secondary flame of 0.003 sec., and an after flame of 0.015 sec. The latter is caused by the burning of combustible gases on mixing with the air. C. G. S.

The study of moving flames. Wm. Payman. Safety in Mines Research station, Buxton. *J. Chem. Soc.* **1928**, 1738–40.—A brief description of the "flame-speed" and "wave speed" cameras used for photographing the motion of flame in gaseous mixts. The former can be used only for photographing slowly moving and feebly actinic flames, while the latter can be used for all kinds of flames and shock-waves, and also in an undarkened room. In both, the photographic film is stretched around a revolving

drum, provided with a device for synchronizing the time of exposure with the moment of passage of the flame across the field of view. In the flame-speed camera a diverging beam from a powerful mirror-arc lamp passes through a small orifice (giving a point source), and through the explosion-tube to the camera drum. By placing a plano-convex condenser (20 cm. diam.) between the explosion-vessel and the camera film, a reduction of about $^1/_4$ the actual size is obtained, eliminating the use of too wide a film for photographing the entire explosion. In the wave-speed camera (cf. *C. A.* **20,** 2074; **21,** 322, for a complete description) a beam from a mirror-arc lamp, so reflected by a concave mirror to be convergent, is focussed on the camera lens, a diaphragm on which serves to sep. refracted from non-refracted light. By properly arranging the 2 cameras a direct photograph is obtained of the flame the same in size as the refraction photograph, providing the flame is sufficiently actinic. J. BALOZIAN

Striated photographic records of explosion waves. II. An explanation of the striae. COLIN CAMPBELL AND ARTHUR C. FINCH *J. Chem. Soc.* **1928,** 2094–106; cf. *C. A.* **21,** 3271.—Several theories have been advanced to account for the striae observed in photographs taken with a moving-film camera, of explosions waves produced in gaseous mixts., especially those of CO and O_2, with or without addns. of small quantities of H. These theories have been investigated experimentally and it is concluded that the theory of E. F. Grieg, *viz.*, that the striae are due to the flame traveling along a helical path in the tube best accounts for all the facts observed. C. E. M.

Fatal accident at Billingham. ANON. *Chem. Age* (London) **19,** 237(1928).—An explosion, by which two men were killed, occurred Sept. 9, 1928 at the CO gas holders of the Synthetic Ammonia and Nitrates branch of the Imperial Chem. Industries. The men killed were on a platform some 30 ft. high working at a repair job when the gas escaped from a holder mixed with air and took fire from an unknown source. The gas mains were provided with isolation valves held closed against the pressure of the gas by oil pressure on the opposite side of the piston and by some undetd. means one of these valves is believed to have been released. CHARLES E. MUNROE

Detonation explosive. THORVALD LINDEMAN and MAGNE HAFSTAD. Norw. 44,012, May 9, 1927. A finely pulverized alloy contg. metallic Ce together with another strongly electropositive metal such as Mg, Al or both is mixed with an oxidizing substance, for instance $KClO_3$, NH_4NO_3, $KMnO_4$, $KCrO_4$, etc. The content of Ce of the alloy may be replaced in full or in part by other metals belonging to the group of the rare earth metals.

Time fuses for explosives. CURTIS'S & HARVEY, LTD., AND A. J. GRIMWOOD. Brit. 283,741, Jan. 21, 1927. A black powder used for loading time fuses is made by use of "cuprene" (a condensation product of C_2H_2 described in Brit. 146,258 (*C. A.* **14,** 3533)) instead of all or part of the charcoal usually employed. This powder is firmly compressed in grooves of rings which may be made of brass or of Al alloy with brass-lined grooves.

25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

The Sandoz chemical works, Basle, Switzerland. CHAS. E. MULLIN. *Am. Dyestuff Rept.* **17,** 594–5(1928).—Special reference is made to the production of immunized cotton at this plant. L. W. RIGGS

The relation between laboratory and bulk production. H. H. HODGSON. *J. Soc. Dyers Colourists* **44,** 275–6(1928). L. W. RIGGS

Colors in commerce. EDWIN W. ELY. U. S. Bureau of Standards. *Am. Dyestuff Rept.* **17,** 572(1928).—The subject is discussed from the points of view of the manufacturer, the distributor and the consumer. The situation is summed up as follows: Overdiversification is wasteful. Overstandardization stultifies and restricts. Simplification, intelligently and moderately applied, offers a happy medium between these 2 extremes. L. W. RIGGS

Constitution of colors. GEORGE V. HEYL. *Paint, Oil Chem. Rev.* **86,** No. 8, 8–11, 15(1928).—The constitution of lithol red and the dyes generally grouped under the name of lithols are reviewed. Many lac-dyes and org. pigments are studied with respect to the effect of their constitution on shade and phys. properties. True *lithols* are differentiated from *pseudo-lithols* and red org. pigments. The lake reds are classified and reviewed with reference to prepn. and color groups. R. J. MOORE

Brief review of the development of anthraquinone dyes. ROBERT E. SCHMIDT. *Z. angew. Chem.* 41, 41–6, 80–5(1928). E. H.

Some chemical and physical properties of anthracene blue. RAYMOND L. DREW. *Am. Dyestuff Rept.* 17, 591(1928).—The sol. Anthracene Blues are described in a general way, and Anthracene Blue WR and WG are compared as to their dyeing properties. L. W. RIGGS

Auxanin B. PAUL RABE. *Melliand Textilber.* 9, 665(1928).—By working silk, rayon or cotton fabrics dyed with basic colors on Katanol-Sb mordant in a bath made of 2–5% Auxanin B (on wt. of goods) and a little NaCl and HOAc for 45 min. at 25–30°, a marked increase in light-fastness results. E. R. CLARK

Manufacture of para red. D. DAVIDSON. *Paint, Oil Chem. Rev.* 86, No. 1, 18D–20(1928).—The uses and manuf. of para red are reviewed. Detailed formulas and procedure for prepg. extra light, bluish light and dark para reds are given. R. J. MOORE

Condensation of badan extract with *p*-nitrosodimethylaniline. S. N. GODNEV. *J. Chem. Ind.* (Moscow) 5, 78–9(1928); cf. *C. A.* 22, 3302.—Dyestuffs can be obtained by condensation of badan ext. with aromatic compds. Thus, when 10 pts. (by weight) of dry badan ext., 7 pts. *p*-nitrosodimethylaniline-HCl and 200 pts. CH_3OH or C_2H_5OH are heated on a water bath the mixt. acquires first a yellow-brown, then a black-green and finally a black color. After 8–10 hrs. of heating, the alc. is distd. off and the resine-like residue is dried in a vacuum oven below 50° till it becomes solid. To sep. the insol. substances the solid is treated with 50 times its weight of hot water, filtered and the filtrate is evapd. to dryness on a water bath. The yield of the sol. dyestuff is 8%. The dyestuff is sol. in cold water, CH_3OH and C_2H_5OH. Dil. acids such as CH_3COOH, $(COOH)_2$, HCl and H_2SO_4 dissolve it with a red-brown color, concd. solns. being black. C_6H_6 and ether do not dissolve it. 0.5 *N* NaOH or Na_2CO_3 ppts. the dyestuff from its aq. solns. Tests for the presence of tannins show negative results, and this indicates that the dyestuff was formed at the expense of tannins and *p*-nitrosodimethylaniline. By direct dyeing of wool and cotton black, brown and dark gray colors are obtained. Acid dyeing of wool yields dark brown colors, whereas alk. dyeing of cotton gives gray-blue colors. If the dyestuff soln. is used in the presence of reducing agents, wool is dyed in brown and cotton in gray-blue. Attempts to condense the badan ext. with *p*-nitrosophenol under the same conditions have been unsuccessful. B. N.

Alizarin lakes. S. LIPATOV. *Melliand Textilber.* 9, 496–7(1928).—The combination of NO_2-Alizarin with Cu and Ba is a strictly chem. process following the laws of mass action. E. R. CLARK

Azoic colors on wool. S. C. TURNER. *J. Soc. Dyers Colourists* 44, 276–80(1928).—Expts. were made to det. the absorption of members of the Naphthol AS series by wool, and the naphtholated wool was examd. for damage by the caustic alkali used. The results are shown in 7 tables and 4 charts of graphs. Wool was not weakened by being naphtholated, nor did damage occur until the concn. of NaOH in the dye bath reached about 1.25 g. per l. Salt protected the fiber to some extent and increased the absorption of different naphthols in amts. varying from 0.8 to 82.7%. Salt slowly pptd. the naphthols from soln. at different rates for different naphthols. This action was stabilized by the addn. of Leonil S, which also acted as a protective colloid against damage by alkali, and, being a wetting-out agent, increased the penetration of the naphthol, thus promoting level dyeing. L. W. RIGGS

Indanthrene colors on rayon. GEORGE RUDOLPH. *Textile World* 74, 961–3 (1928).—See *C. A.* 22, 2276. RUBY K. WORNER

Testing the suitability of dyes for viscose rayon. A. J. HALL. *Am. Dyestuff Rept.* 17, 585–6(1928); cf. *C. A.* 21, 1357.—Sufficient uniform yarn from the same consignment of viscose should be reserved in storage for a large no. of tests. One-half of the test samples in skein form is uniformly immersed for 4 hrs. at room temp. in a 5% soln. of NaOH. The yarn is then well washed and is soured with HCl or AcOH, again is washed free of acid, hydroextd. and dried at 50°. In testing the suitability of a dye for viscose or other cellulose rayon, samples of yarn treated as above described and untreated samples are dyed together. If the dye used is an even one the 2 samples of dyed yarn will have nearly the same shade, but if the dye is an uneven one, the alkali-treated silk will be much deeper in shade than the untreated silk. L. W. R.

Selection of direct cotton dyes for viscose rayon. COURTAULDS, LTD. *Kunstseide* 10, 161–3(1928); cf. *C. A.* 22, 2060.—A new test, called the "temperature range test," is described, which involves testing the affinity of rayon for a given dye at different temps. (20–90°). Dyes showing max. affinity at 20° give the most even results on a large scale, while those dyes showing a max. affinity at 90° give the most uneven results.

Preference should be given therefore to those dyes showing max. affinity at 20°. These dyes, however, may be dyed at higher temps. A no. of direct cotton dyes are classified on the foregoing basis. FREDERICK C. HAHN

The development of dyeing and printing works in the last ten years. R. HALLER. *Z. angew. Chem.* **41,** 121–7(1928). E. H.

Physical chemistry of aniline black dyeing. ERNST KRAUS. *Melliand Textilber.* 9, 494–6(1928).—A consideration of ionic reactions involved. The max. fixation of $PhNH_2$ with min. loss by volatilization follows when the $PhNH_2$ salt is made with strong acids. The drying and oxidation should be carried out at the lowest possible temp. and the reaction mixt. should contain salts of strong bases with the acid used. E. R. CLARK

Studying Naphthol AS dyeing with cellophane. GUSTAV SCHWEN. *Melliand Textilber.* **9,** 674–5(1928).—By dyeing cellophane with Naphthol AS and coupling with the Fast Reds, etc., a material may be prepd. which facilitates study of changes in the dispersion of the color particles. Thus the effect of soaping is immediately seen in a change from transparency to cloudiness. With several combinations it was noted that hot pressing (230–250°) caused a reversal of this action, cloudy samples becoming clear. The temp. of this transition is related to the m. p. of the Naphthol AS-Fast red compd. E. R. CLARK

The physical condition of steam in continuous agers. P. AUG. DRIESSEN. *Melliand Textilber.* **9,** 670–1(1928).—While dyeing directions call for such conditions as moist steam free from air in the ager, it is rarely true that mill operatives have a proper conception of what is meant. It is suggested that "dry" steam be defined as steam so superheated that isothermal compression and considerable cooling do not induce mist formation. "Saturated" steam is invisible and mist-free, but very slight cooling or isothermal compression produces mist. "Damp" steam carries water as mist. In general the satd. condition is best for dye fixation. An atm. of satd. steam can only be attained by a very close check on temp. with due regard to barometric variations. E. R. CLARK

Colloresin D (dry) and its uses in textile printing. PFEFFER AND GMELIN. *Melliand Textilber.* **9,** 666(1928).—This substance is a cellulose ether produced by the I. G. It is sold as a dry, colorless wadding. In 8 times its wt. of warm water it swells slowly to yield a thick paste, the swelling being accelerated by the use of Nekal BX Heat induces coagulation while non-volatile alkalies and acids in general and water-sol. org. liquids such as glycerol decrease the viscosity. Tannins cause pptn. As compared with starch, gums, etc., for use in printing pastes, Colloresin offers the advantages of easier removal, freedom from mold growth, and better fastness of dyeings. In printing vat colors with its aid, the goods are printed with the Colloresin-thickened color mixt., and are then dried, treated with $Na_2S_2O_4$, steamed out of contact with air and soaped. Various other procedures are described. E. R. CLARK

The dyeing of Manila fiber. FRED GROVE-PALMER. *Textile World* **74,** 963–5, 1023(1928).—When cheapness is the main consideration, basic dyes may be used. In this process, the tannin which is a constituent of Manila hemp acts as a mordant. If fastness to light is important, substantive dyestuffs are preferable. Addn. of logwood-iron black will improve the dyeing of those fabrics which are to receive very strenuous treatment in wear. Luster is best obtained in a sep. bath after dyeing the fiber or fabric. RUBY K. WORNER

Bleaching and dyeing of muga silk. FRED GROVE-PALMER. *Am. Dyestuff Rept.* **17,** 579–90, 605–6(1928).—The crude methods of producing muga silk in India are described. In dyeing muga silk the gum is first removed and the fiber is put into a bleach bath made as follows: 1.25 gal. of tech. 85% HCO_2H and 0.25 lb. Na_3PO_4 are added to 120 gal. of soft water. To this soln. about 9 lb. of Na_2O_2 is added gradually with const. stirring and the reaction of the bath is adjusted by acid or alkali to a faint alky. when 2.5 pints of Turkey red oil is added to the bath and the goods are entered. The bath should be kept at 30° for 2 hrs., when it is raised slowly to 50° and is maintained at 50° for 2 hrs. The steam is then shut off and the bath, with the goods, is allowed to stand until the next day or longer. The bleached fiber is then rinsed in at least 3 waters. The dyeing of muga silk is about the same as for other silks, due allowance being made for the natural yellowness of the fiber, which is not entirely bleached out. L. W. RIGGS

Action of light on cotton dyed with vat dyestuffs. F. SCHOLEFIELD AND C. K. PATEL. *J. Soc. Dyers Colourists* **44,** 268–74(1928).—(1) Certain cases of tendering, which have occurred during the dyeing of viscose and cotton with vat dyestuffs, are to be attributed to the incidence of light on the dyed material during the dyeing process,

or before the first wash. (2) In other cases the effect of light at this stage is to produce a change in hue, and exceptionally, a partial or apparently complete destruction of the dyestuff. (3) The colors involved are mainly yellows and oranges, though Indanthrene Yellow G and Alizanthrene Yellow 6R are exceptions which produce neither change of shade nor tendering of cotton or viscose. (4) Similar effects were produced by impregnating the dyed material with weak alk. solns. of H_2O_2 and exposing to light. (5) The explanation of the chem. actions which occur is to be found in the production of H_2O_2 by exposure of the leuco-vat dye to air, and the activation of this H_2O_2 by light absorbed by the dyestuff. The alkali present in the dyebath accelerates this oxidation. (6) Should a second dyestuff be present this may be oxidized preferentially to the cellulose or to the original yellow or orange. Ciba Blue 2B was especially sensitive in this respect. (7) The foregoing results appear to support the theory that H_2O_2 is an immediate cause in the fading of dyed fabrics. L. W. RIGGS

Feltron C in the hat industry. RICHARD HAGEN. *Melliand Textilber.* **9,** 680–1 (1928).—This I. G. product restrains the browning of hat felts accompanying long contact with hot dyeing liquids. Consequently, its use facilitates the production of light clear shades. E. R. CLARK

The structure of individual fibers. CHARLES F. GOLDTHWAIT. Mellon Inst. *Proc. Am. Assoc. Textile Chem. Colorists* **1928,** 221–7; *Am. Dyestuff Rept.* **17,** 565–71.—The object of this paper is "to review briefly some of the more up-to-date ideas on the structure and behavior of textile fibers." The references are chiefly to work done in England during the past 2 or 3 years. L. W. RIGGS

Fiber cross-sections. A. HERZOG. *Kunstseide* **10,** 111–5(1928); cf. *C. A.* **22,** 2843.—Details are given for measuring the cross-sections of fibers, which consists in the following 3 stages: (1) direct measurement of sections under the microscope; (2) projection of microscopic image on a screen divided into squares of $^1/_4$ deniers; (3) measurement of the drawing of microscopic sections with the aid of drawing app. which operates without distorting the picture. FREDERICK C. HAHN

Delignification of jute fiber. JOGENDRA KUMAR CHOWDHURY AND RANENDRA KUMAR DAS. Dacca Univ. *J. Indian Chem. Soc.* **5,** 231–43(1928).—The study of delignifying jute is taken up. Beechwood creosote (I) is selected as the solvent for the lignone having the least effect on the cellulose. I hardens the jute fibers in the autoclave on account of its acidic nature converting the cellulose into hydrocellulose. Ten % C_5H_5N on the amt. of I used has the max. effect and is superior to NH_3 or $PhNH_2$, leaving the fibers with good tensile strength. Max. delignification was obtained without serious injury to the fiber by heating at 193–195° at 28–30 atm. pressure for 4 hrs. The addn. of HCl or I_2 as catalysts did not assist delignification. Analysis of the treated jute indicates a decrease in lignone from 19.7 to 4.4% and a furfural decrease from 11.0 to 8.7%. The β-cellulose content may be reduced in the jute by heating with 6% NaOH. It appears probable that in jute the incrusting matter is a lignone-cellulose complex and that the incrusting matter is very firmly fixed to the cellulose. The moisture in jute varied from 9 to 13%. D. H. POWERS

How warp-knit fabric can be approximately analyzed to aid duplication by trial and error. R. PRESGRAVE. *Textile World* **74,** 1451–3(1928).—The following factors are considered in regard to glove-silk fabric made on tricot and milanese machines type of cloth (tricot or milanese); nature and size of yarn used; distribution of yarn on the warps and in the needles; type of stitch (including ratio between warp lengths and the no. of bars used; gage of machine; length of rack ("quality"); ratio between finished width and knitted width; and weight of a unit area. RUBY K. WORNER

Testing knit-goods accessories. WM. DAVIS. *Textile World* **74,** 1453–5, 1163 (1928).—The ballistic testing machine, designed by the Cotton Research Assocn. of Great Britain for examg. ribbons, tapes and bands for breaking force, is described and illustrated. RUBY K. WORNER

Tensile testing of single wool fibers. P. KRAIS. *J. Text. Inst.* **19,** 32–6T(1928).—The "Deforden" app. for measuring the tensile strength, breaking extension, and torsional resistance of single fibers is described in detail, and examples of its application to tech. problems are given. There is no difference in strength between wool and "bristly" hairs of the same diam., but the latter have the higher percentage extension at the breaking point. B. C. A.

Plasticity of wool. J. B. SPEAKMAN. Univ. Leeds. *Proc. Roy. Soc.* (London), **B103,** 377–96(1928).—Wool contains elastic and plastic elements arranged in parallel. Wool fibers are imperfectly elastic in water as a result of the plasticity and rupture of fibrillae within the constituent cells. This fibrillar plasticity is due to hydrolytic changes assocd. with the peptide linkages; it may be reduced by reagents which react

or combine with the imido groups, thereby decreasing their affinity for water and inhibiting the hydrolysis of the peptide linkages. JOSEPH S. HEPBURN

Primary action of chromic acid on wool fiber. M. A. IL'INSKII AND D. I. KODNER. *Z. angew. Chem.* **41**, 283-5(1928); cf. *C. A.* **22**, 3329.—Wool fiber absorbs chromic acid from soln. even in presence of mineral acids, to form a complex in which the wool substance acts as a base, combining with about 10% of chromic acid. This is about the equiv. quantity on the assumption that the mol. contains 2 basic (NH_2) groups. The complex is stable towards water. B. C. A.

Phenomenon of wetting in the wool textile trade. J. B. SPEAKMAN. *J. Textile Sci.* **2**, 114-8(1928).—The development and tests of wetting agents are described. Under the use of wetting agents as assistants in the various processes in woolen textile manuf., several com. emulsifiers are considered. L. W. RIGGS

Yorkshire rivers purification—wool manufacturer's problem. ALFRED F. BARKER. *J. Textile Sci.* **2**, 97-9(1928).—The wool-scouring industry in Yorkshire has a by-product of approx. 34,000 tons of fats, 33,000 tons of soils and 11,000 tons of K salts. These by-products are among the chief sources of river contamination. This contamination may be avoided by having the wool cleaned before shipping or at the port of entry. L. W. RIGGS

Reducing the solubility of sericin. FRED GROVE-PALMER. *Am. Dyestuff Reptr.* **17**, 555-7(1928).—A "hard" silk contg. 17.8% of sericin and a "soft" Kashmir silk with 28 to 29% of sericin are compared. In the boil-off Kashmir silk loses its sericin more readily than hard silk. If the soft silk is treated from 15 to 30 min. with 4% HCHO at ordinary temp. the sericin became less sol. in boiling water, or in the soupling bath of 1% Marseilles soap at 70°. The loss of sericin was least when the silk was treated with 3% HCHO for 15 min. at temps. ranging from 72° to 85°. Above 85° the loss of sericin increased rapidly with the rise in temp. L. W. RIGGS

Shortcomings of rayon. CAMILLA. *Kunstseide* **10**, 120-1(1928).—The worst shortcoming of rayon is the brittleness of threads. Two factors to which the brittleness is attributed are the effects of iron and acid. A number of data are given which show the influence of acid on the Cu no. HCl and H_2SO_4 were used in concns. up to 1%. The influence of acid increases the Cu no. as high as 7 times that of the undamaged rayon With regard to the effect of Fe, it is stated that the brittle spots had a content of Fe exceeding that of normal rayon by 20%. FREDERICK C. HAHN

Uniform testing methods for rayon. H. STADLINGER. *Kunstseide* **10**, 245-8 (1928). The importance of standard testing methods for rayon is emphasized. Examples are given of inconsistent results obtained in different testing labs. A comm. consisting of both practical and academic men, formed in Germany to study this question, has adopted regulations concerning uniform methods for the following points: definition and discrimination of rayon and silk; tests for discriminating rayon and silk; kinds of rayon; detn. of titer, stretching, tensile strength, breaking tension. Detailed conditions are given for the tests. FREDERICK C. HAHN

Effect of moisture on the strength and elongation of rayon. Y. KAMI. *Kunstseide* **10**, 207(1928); cf. *C. A.* **22**, 1047.—Rayon shows increased elongation by wetting with water and at the same time loses its strength. The magnitude of the increased elongation and decreased strength is independent of the duration of moistening. FREDERICK C. HAHN

Cellulose acetate rayon-cotton mixed fabrics. K. WOLFGANG. *Kunsteide* **10**, 117-8(1928).—General rules are given for dyeing fabrics of this type. F. C. HAHN

Attack of cotton by mineral oils at higher temperatures. H. STÄGER. *Helv. Chim Acta* **11**, 377-86(1928).—A comparison is made of the attack of cotton wool by turpentine and transformer oil mixed with various org. acids. The results indicate that the disintegration of the insulation of transformers is not due to acids formed by oxidation of transformer oil, and support the view that interfacial forces are the important factor. B. C. A.

Effect of processing on affinity of cotton for metallic salts and Naphthol AS. KARL HENKEL. *Melliand Textilber.* **9**, 149-50, 501-2(1928).—The impurities in cotton have a bearing on the absorption of mordants and Naphthol AS. *E. g.*, in standard dyeing tests, Egyptian cotton absorbed 0.232 mol. Naphthol AS when dyed without boiling out. Boiled out cotton of similar type combined with 0.198 mol., bleached with 0.218 mol., and mercerized with 0.335 mol. Consequently where cotton cannot be dyed in the imperfectly purified state a certain extra consumption of dyes must be accepted, unless the material is mercerized. Of various metallic salts, cotton shows the greatest affinity for those of Al when the absorption is expressed in mols. E. R. CLARK

Estimation of china clay in sized cotton goods. GEORGE SMITH. *J. Textile Inst.* **19,** T323-8(1928).—The previously published methods for the estn. of China clay in sized cotton goods are criticised and the following method is recommended: From 1 to 2 g. of cloth is weighed accurately and is treated with 20 cc. of HCl (sp. gr. 1.1) in the boiling water bath until well disintegrated, when it is filtered through a Gooch or ashless filter and the residue is washed free of HCl. After drying at 100° to const. wt. the residue is ignited at a bright red heat in a Pt or SiO_2 crucible and weighed as "ignited clay." This wt. divided by the factor 0.87 gives the wt. of dry clay. If a sample of the original clay is at hand the correction factor may be detd. by expt. L. W. R.

The uses of esterified cotton. G. E. L. HIND. *J. Soc. Dyers Colourists* **44,** 280-1 (1928).—"The main purpose of esterifying cotton is to enable the production of numerous effects by piece dyeing instead of yarn dyeing, and apart from any saving in costs, its use should lessen the risks of stock-keeping and thus enable manufacturers to have at their disposal a more extended range of colors and also give quicker delivery. Patents covering the process are pending." L. W. RIGGS

Comparative p_H values of starches used by some North Carolina cotton mills. A. H. GRIMSHAW. *Textile World* **74,** 1327-31(1928); cf. *C. A.* **22,** 3798.—A detailed description of the procedure used for testing the p_H value of starches with the La Motte Roulette Comparator is included. RUBY K. WORNER

Soft water in the kier boil. S. F. ALLING. *Am. Dyestuff Rept.* **17,** 558(1928).—If not practicable to use soft water in all processes in the cotton mill, it should always be used in the kier boil for the removal of fats and waxes. L. W. RIGGS

Hypochlorite bleaching. M. MUNSCH. *Melliand Textilber.* **9,** 487-92(1928).—The current tendency to reduce the severity of purifying treatments preceding the chemicking of vegetable fibers has revived interest in the effect of HOCl on the non-cellulose compds. present in the raw material. The fate of N compds. is of special interest. The data given indicate that primary amino compds. yield NH_3 when treated with HOCl. This itself reacts immediately to form NH_2Cl whose presence may be detected by its characteristic odor, especially noticeable in linen bleaching; although sol., NH_2Cl has a mordanting action fixing colors from the chemic bath on the fiber being bleached. Cotton treated with an old linen bleaching chemic becomes stained. If the original N compds. yield secondary or tertiary N compds. on the fibers following alk. digestion, the chloroamines formed are insol. and yield active Cl and HCl on storage with resultant tendering. To remove them an addnl. alk. treatment rather than antichloring is required. E. R. CLARK

Chlorine as a bleaching agent for cotton. YNGVE DALSTRÖM. *Svensk Kem. Tids.* **40,** 106-18(1928).—A critical review of current methods in laundry investigations in which many tests are tabulated. Activated Cl is discredited as harmful to cellulose textiles. Cl forms oxycellulose much more readily than does O_2 and decreases more than tensile strength of cotton ribbons. This is explained by the formation of nascent HCl. Small quantities of sol. SiO_2 [60 mg. per l.] protect cellulose from injury by Cl. Perborates are favored as less injurious to fabrics and more efficient in oxidizing pigments. A. R. ROSE

Efficiency of the bleach or dye impaired by condition of wool. GEORGE RICE. *Dyer Calico Printer* **60,** 28(1928).—A general article, including a description of the steeping process for treating very dirty wools. RUBY K. WORNER

Zinc soap (damage to textiles). KEHREN. *Melliand Textilber.* **9,** 687-92(1928).—By reason of the corrosive action of mild alkalies including soap solns., Zn stains are fairly common on bleached and dyed fabrics. The diphenylamine acetate-$K_4Fe(CN)_6$ test for Zn brings out this type of damage clearly. E. R. CLARK

Colors for paint, lacquer and graphic industries (HEYL) **26.** Analysis of sulfonated oils (THOMAS) **27.** Dispersoidological investigations. XVIII. The structure of fibers (VEIMARN, *et al.*) **2.** Cleaning furs (Brit. 283,709) **29.** Dye soap (Can. pat. 281,874) **27.** Derivative from ligninsulfonic acid (Can. pat. 282,677) **23.**

Research and the Cotton Industry. Edited by R. H. Pickard. Manchester: The British Cotton Industry Research Assoc. 80 pp. Price to non-members, 5s. Reviewed in *J. Soc. Dyers Colourists* **44,** 23(1928).

Shirley Institute Memoirs, Vol. VI, 1927. Published by the British Cotton Industry Research Assoc., Didsbury. 132 pp. Reviewed in *J. Textile Inst.* **19,** 190(1928).

Dyes. DURAND & HUGUENIN A.-G. Brit. 283,482, Jan. 10, 1927. Brown mordant dyes are made by diazotizing an aminoazo compd. of the type R^1-N:N-R^2NH_2

(in which R^1 is an aromatic residue contg. an OH group in *o*-position to a COOH group and R^2 is an aromatic residue contg. a sulfonic or COOH group) and treating the resulting diazo compd. in an alk. or acid medium, at ordinary or higher temp., until its coupling powder has disappeared. Several examples are given.

Dyes. I. G. Farbenind. A.-G. Brit. 283,777, May 24, 1927. Black copying colors are obtained by coupling a diazotized dialkylated phenosafranine with a cresol, *e. g.*, from diethylphenosafranine and *p*-cresol.

Dyes. I. G. Farbenind. A.-G. Brit. 283,897, Jan. 19, 1927. Sol. dyes are obtained either by sulfonation of the monoazo dyes produced by coupling a diazotized *o*-nitroarylamine with an acetoacetic arylide or by coupling a diazotized *o*-nitroarylamine with a sulfonic acid of an acetoacetic arylide, of which examples are given. The products yield full yellow shades fast to light and to water when used as size colors, and dye wool evenly in clear yellow shades fast to light and fulling.

Dyes. I. G. Farbenind. A.-G. Brit. 283,979, July 17, 1926. The dyes obtainable by coupling *o*-hydroxy-diazo compds. with a naphthol or an arylaminonaphtholsulfonic acid are converted into Cr compds. by treating them with Cr formate or other suitable chroming compds. under the action of heat and pressure. Examples are given of dyes producing blue and brown fast shades on wool.

Dyes. Karl Thiess, Bernhard Deicke and Robert Schmidlin (to Grasselli Dyestuff Corp.). U. S. 1,684,331, Sept. 11. Dyes "more or less easily sol. in water," which dye animal fibers greenish yellow to brown-red tints of good fastness to light and to fulling, are obtained by condensing 1,3-dihalo-2,6-dinitrobenzene (or substitution products) with 2 mol. proportions of a 4-aminodiphenylaminosulfonic acid (or a substitution product). The condensation is preferably effected at boiling temp. A catalyst such as a Cu compd. or alc. may also be present. Several examples are given.

Dyes and intermediates. R. Vidal. Brit. 283,467, Jan. 8, 1927. Sepn. of amino compds. such as those produced by the reduction of nitroso compds. of α- and β-naphthol, phenol, *o*- and *m*-cresol and dimethylaniline by aq. Na_2S is effected by the use of NH_4 salts such as NH_4Cl or $(NH_4)_2SO_4$ as pptg. agents. A similar sepn. may be effected with products obtained by condensation, by means of Na_2S, of nitrosophenols, nitrosonaphthols and nitrosodimethylaniline with phenols or aromatic amines. When aniline, dimethylaniline or nitrosodimethylaniline is employed, alc. is added. Sulfuretted dyes are made by fusion with S of both the amino compds. and the condensation products sepd. as described.

Sulfur black dyes. R. Vidal. Brit. 283,468, Jan. 8, 1927. Di- or tri-nitrophenol or their mixts. are introduced into an aq. soln. formed from cryst. Na_2S, and after heating to complete the reaction the mass is cooled and nitrosophenol or nitroso-*o*- or *m*-cresol is added. The dye may be isolated by diln. with water and aeration to effect oxidation and pptn. with an NH_4 salt. Cf. *C. A.* **22,** 3536.

Anthraquinone derivatives. I. G. Farbenind. A.-G. Fr. 635,040, May 25, 1927. 1-Anthraquinonyl ketones are prepd. by the action of an oxidizing acid, preferably chromic acid, on a benzanthrone, in which at least 1 H atom in the Bz-1 or Bz-2 position is substituted by an alkyl, aryl, acyl, aroyl, nitro or carboxylic group. Thus 1-benzoylanthraquinone is prepd. from Bz-1-phenylbenzanthrone, and 1-acetylanthraquinone from Bz-1-methylbenzanthrone. Several examples are given. The compds. are *intermediate products for dyes.*

Azo dyes. Erwin Hoffa and Erich Fischer (to Grasselli Dyestuff Corp.). U. S. 1,684,275, Sept. 11. A 4-nitro-2-diazobenzene-1-carboxylic acid ester, *e. g.*, the diazo compd. from 4-nitro-2-amino-1-benzoic acid methyl ester, is caused to react with 2-hydroxynaphthalene-3-carboxylic acid anilide or similar compd. to obtain products which are suitable for use as pigment dyes. The components mentioned, coupled in the presence of a substratum, give a pigment of bluish red color of good fastness to light and suitable for use on *wall-paper.* Cf. *C. A.* **22,** 3995.

Azo dyes from pyridine. Iwan Ostromislensky (to The Pyridium Corp.). Can. 283,436, Sept. 18, 1928. Diazotized aniline and α,α-diaminopyridine are directly coupled in the proportions of more than 46.5 and less than 186 g. of the first and 109 g. of the second. The product is purified by recrystn. from boiling water.

Azo dyes and their chromium compounds. Société anon. pour l'industrie chimique à Bâle. Ger. 452,014, Nov. 4, 1927. 3-Aminonaphthalene-1,8-dicarboxylic acid is diazotized with any suitable diazo compd. and developed with any suitable developing compd. The azo dye resulting is then treated with a chromium-yielding reagent. *E. g.*, 10.7 parts of the above-named acid is dissolved in 150 parts H_2O with the aid of 10 parts of 30% NaOH, treated with 10 parts of soda, cooled and treated

with the diazo compd. produced from 8.5 parts of p-$H_2NC_6H_4SO_3H$. The dye is salted red and dried. Other amino sulfonic acids can be substituted. The above acid . is treated with 11.7 parts of 2,4,5-$O_2N(HO)(H_2N)C_6H_3SO_3H$ diazotized or various other chloronitromethylaminophenolsulfonic acids. 3-Aminonaphthalene-1,8-dicarboxylic anhydride (10.6 parts) is dissolved in 150 parts of H_2O with the aid of 10 parts of 30% NaOH, cooled to 20° with 30 parts of ice and treated with 25 parts of 30% HCl. Nitrite soln. (3.5 parts) is added and the diazo compd. is pptd. The resulting suspension is run into an alk. soln. of 6.9 parts of salicylic acid. After the developing is ended the excess alkali is neutralized with acid and the dye salted out, filtered and dried. 1, 8-Aminonaphthol-4,6-disulfonic acid (16 parts) is substituted for the salicylic acid. The dye produced from 3-aminonaphthalene-1,8-dicarboxylic acid and diazotized 3,4,5-$H_2N(HO)(O_2N)C_6H_2SO_3H$ is boiled in 950 parts of water with Cr formate soln. corresponding to 22.6 parts of Cr_2O_3. The Cr compd. is obtained by salting out 47.6 parts of dye resulting from the acid and diazotized 2,3,5-$HO(H_2N)$-$(O_2N)C_6H_2SO_3H$ in 950 parts of H_2O boiled with a CrF_3 soln. corresponding to 22.6 parts of Cr_2O_3. The product is washed with water, dissolved with warm, weak NaOH soln., neutralized with AcOH and sepd. 52.6 parts of the dye resulting from the acid and diazotized 1,2,3,5-$HO(H_2N)(HO_3S)C_6H_2CO_2H$ in 1000 parts H_2O are treated as in the preceding example. 53.3 parts of dye resulting from 4,8,2-$HO(H_2N)$-$C_{10}H_5SO_3H$ and diazotized 3,1,8-$H_2NC_{10}H_5(CO_2H)_2$ in 150 parts of H_2O is boiled with $Cr(OAc)_3$ soln. corresponding to 22.8 parts of Cr_2O_3. 58.7 parts of dye resulting from 2,6-$HOC_{10}H_6SO_3H$ in 1500 parts of boiling H_2O is boiled with $Cr(OAc)_3$ soln. corresponding to 22.8 parts of Cr_2O_3. 58.8 parts of dye resulting from 1,4-$HOC_{10}H_6SO_3H$ and diazotized 3,1,8-$H_2NC_{10}H_5(CO_2H)_2$ in 1800 parts of boiling H_2O is boiled with $Cr(OAc)_3$ soln. corresponding to 15.2 parts of Cr_2O_3. Cf. *C. A.* **21**, 3468.

Vat dyes. Walter Mieg and Albert Job (to Grasselli Dyestuff Corp.). U. S. 1,684,327, Sept. 11. Dianthraquinonylaminophenanthrenequinonylenes are obtained from α- or β-aminoanthraquinones, or, preferably, from α-aminoanthraquinones and 2,7-dihalophenanthrenequinones. A product may be thus obtained which dyes cotton from a vat copper-red shades. Various details and examples are given.

Water-soluble dyes. Otto Siebert, Karl Thiess, Bernard Schöner, Robert Schmidlin, Walther Benade and Bernhard Deicke (to Grasselli Dyestuff Corp.). U. S. 1,684,330, Sept. 11. Dyes of good fastness to light and suitable for use on *leather* or other materials are obtained by causing 4-nitro-4′-aminodiphenylamine-2-sulfonic acid or other suitable 4-aminodiphenylamine compd. to react upon 2-nitro-1-chlorobenzene or other suitable similar halogenated benzene deriv. (which may also contain a sulfonic group). Several examples are given.

Dispersing agents for dyes. Soc. anon. pour l'ind. chim. à Bâle. Fr. 634,864, May 23, 1927. The residues from the distn. of BzH, turpentine and colophony are treated with sulfonating agents such as H_2SO_4, oleum or chlorosulfonic acid and are used as addns. to dye baths particularly for dyeing artificial silk with insol. or slightly sol. dyes.

Dyeing. Courtaulds, Ltd., H. J. Hegan and J. H. Taylor. Brit. 283,672, Nov. 1, 1926. Tendering of cotton, artificial silk and similar materials by the immunizing treatment with tannic acid and $SnCl_2$ is avoided by a final treatment with a weakly alk. agent such as a soap soln. or a dil. Na_2CO_3 soln. The material to be immunized may be undyed or dyed with dyes of the indanthrene series or other dyes and the treated material is unchanged when treated with a direct dye.

Dyeing. J. W. Leitch & Co., Ltd., A. E. Everest and J. A. Wallwork. Brit. 283,838, July 8, 1926. Wool either alone or in the presence of other fibers (excepting silk) such as cotton or "viscose silk" is dyed by impregnating with a dil. neutral or slightly alk. soln. of an arylide of 2,3-hydroxynaphthoic acid in the presence of soap or other suitable org. solvent or dispersing agent and developing in a bath contg. a diazo compd. Numerous examples and details are given. Brit. 283,839 specifies dyeing silk, either alone or in the presence of other fibers, by impregnating it with an arylide of 2,3-hydroxynaphthoic acid in a soap soln. in the absence of added alkali, and developing in a bath contg. a diazo compd. Printed effects may be obtained, in either of these processes, by printing the impregnated material with a paste contg. a diazo compd. Cf. *C. A.* **22**, 2279.

Dyeing textile materials. Pieter Mijer (to The Two-Tone Corp.). U. S. 1,683,687, Sept. 11. Atomized liquid coloring material is allowed to settle from a homogeneous cloud-like mass on the material to be dyed so as to produce a regular effect without spotting. An app. is described. Cf. *C. A.* **21**, 330.

Removable partition, etc., for dyeing apparatus. W. GERBER. Brit. 284,126, May 24, 1927. Structural features.

Impregnating textiles and other materials. RANGAR S. SKANCKE. Norw. 44,698, Jan. 2, 1928. The materials are treated alternately with aq. solns. of alkali soaps and $Al(OAc)_3$. To the last-named soln. is added some AcOH and water-sol. acetates in order to establish and maintain a p_H in the soln. which favors the impregnating process.

Washable fabrics. ALBERT H. VANDAM (to Turner and Vandam, Inc.). Can. 283,611, Sept. 25, 1928. A washable woven fabric including a glossy white background a shadow design thereon printed with zinc oxide, slightly tinted with a fast dye, and a colored design printed over the shadow design is specified.

Waterproof composition. CARL G. A. LUNDBERG. Can. 282,994, Sept. 4, 1928. Waste material from wool or cotton manuf. or roved wool and cotton is treated with H_2SO_4 for 12 hrs. and the mixt. centrifuged to remove acid. The material is then washed with H_2O for 6 hrs. and again centrifuged, and material then dried. The purified material is treated for 30 min. with a warm (80°) soln. of 78 parts $ZnCl_2$, 14 parts $ZnSO_4$, 8 parts HNO_3 (by wt.) which has been allowed to boil 2 hrs beforehand. The material is liberated from any excess soln. and dried. The material is then impregnated with a rubber soln., cast into molds and subjected to pressure.

Impregnating fabrics. HARRY M. SPECHT. U. S. 1,683,849, Sept. 11. A pile fabric or the like is coated on the back with a compn. of fragrant gums such as benzoin, labdanum, tolu, balsam of Peru or styrax in soln., the soln. is dried and the face of the fabric is treated with a soln. which may also contain suitable fragrant material, the odor of which is suitable for blending with that of the material applied to the back of the fabric. Fabric thus treated is adapted for making powder puffs.

Improving cloth through a galvanic metallic precipitate. WERNER ENZ. Ger. 451,963, Oct. 29, 1927. CuS is pptd. from $CuSO_4$ by H_2S, filtered and drained. Sixty g. CuS is mixed with 60 drops of oleic acid and the mass is applied in a smooth layer to a copper plate. The fabric to be treated is placed on top of this and pressed out. This plate containing the fabric is inserted into a bath of $CuSO_4$ as the negative electrode. A copper plate acts as the positive electrode. A c. d. of 1–1$^1/_2$ amps./30 sq. cm. is used. The fabric after the electrolysis is washed in water, dil. KCN and again in water, then dried. Other materials than Cu and CuS can be used.

Painting silk. ADOLPH A. WETTSTEM. CAN. 283,227, Sept. 11, 1928. Lithopone 45%, yellow chrome 25%, gear varnish 22%, linseed oil 6% and turpentine dryer 2% are mixed together and allowed to age for 72 hrs. The mixt. is then applied to silk, artificial silk and rayons and gold dust or bronze dust is applied to said compd. on either or both sides of the fabric. Any surplus dust is removed by vacuum means from the fabric after the compd. has dried.

Weighting silk. ROBERT J. O'BRIEN, JR. (to Collway Labs.). U. S. 1,684,286, Sept. 11. Rubber in colloidal state in soln. is applied to silk threads.

Apparatus for washing artificial silk or other threads wound on bobbins. SPINNSTOFFWERK GLAUCHAU A.-G. Brit. 283,950, Jan. 21, 1927.

26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

Microscopy of body colors. H. WAGNER AND J. KESSELRING. *Z. angew. Chem.* 41, 833–7(1928).—The use of the microscope in detg. the nature of the constituents of natural and artificial pigments is illustrated by several examples. Various colloidal constituents may be identified by their adsorptive power for certain dyes; *e. g.*, kaolin is colored by basic dyes, colloidal silica by both acid and basic dyes, kieselguhr by basic dyes, and hydrated alumina by acid dyes. Suitable dye solns. contain 1% of Brilliant Green, Acid Violet, or Orange II. Cryst. substances, such as fluorspar, calcite, or dolomite, are detected by the polariscope. B. C. A.

Colors for paint, lacquer and graphic industries. A general survey. GEORGE V. HEYL. *Paint, Oil & Chem. Rev.* 86, No. 1, 10–13, 20–1(1928).—The colors reviewed are classified as follows: (1) inorg., (*a*) natural minerals, (*b*) synthetically processed mineral colors; (2) org., (*a*) natural dyestuffs of animal or vegetable origin, (*b*) synthetically processed of coal-tar origin. Tables are given for classes 1-b, 2-a and 2-b, listing the com. name, chem. company, uses and remarks. Class 2-b is subdivided into color groups and covers also the relative fastness to oil at 30°, to H_2O at 50° and to sunlight. R. J. MOORE

The manufacture of submarine paints. JUAN GARCIA. *Quim. Ind.* **5**, 164–7 (1928).—A discussion of protective paints used for ship hulls and submarine structures. The best and most frequently used paints are: Hg oleate, linoleate, tungstate and resinate, or, better still a combination of Hg-Cu-As salts. Holzapfel's Cu-Hg paint developed in 1885 is one of the best. MARY JACOBSEN

The red-lead question. Action of red lead in rust-protecting paints. H. WOLFF AND R. SINGER. *Farben-Ztg.* 33, 1909–13(1928).—Rahder's statement (*Farben-Ztg.* **33**, 741–3(1927)) that red lead accelerates the corrosion of Fe is true only for the system: red lead–Fe–water, and does not hold for paints in which red lead forms the pigment. The oil adsorbed by highly dispersed red lead may vary very considerably, and is of more importance in detg. the rust-protecting capacity of a paint than is the total oil content. The oil content, degree of dispersion of the pigment, and the swelling capacity of a paint are not interdependent functions. The last-named depends on the free oil content, *i. e.*, on the oil which is not adsorbed on the surfaces of the particles of pigment. The protective action of the paint is due to a thin, almost mol. film in which the oil is present as an extraordinarily strong adsorption complex with the pigment and the base. The swelling capacity of the upper layers cannot therefore be a measure of the protective action of the paint, which is much more likely to be due to the formation of a protective film on the surface of the Fe. B. C. A.

Mechanism of the drying of red lead and white lead pigments. W. VAUBEL. *Z. angew. Chem.* **41**, 181–3(1928).—In the drying of pigments prepd. from red lead and white lead and linseed oil, although the oxidation of the linseed oil to linoxyn is the main process, subsidiary reactions occur as follows: (1) neutralization of the free acids present in the oil by the lead pigment, (2) hydrolysis of the linseed oil by the Pb compd. affording glycerol and lead linoleate, (3) reaction between the Pb compd. and glycerol, (4) neutralization by the Pb compd. of the mono- and di-glycerides present or formed in the drying process, (5) neutralization of the acetic acid or formic acid formed by oxidation in the drying process. Such hydrolysis of the linseed oil may be a source of streakiness in the pigment, owing to the hygroscopic character of the glycerol liberated, and the presence of glycerol so formed constitutes a danger to the effectiveness of the "anti-rust" pigments contg. lead, white lead and red lead reacting only very slowly with glycerol. Litharge reacts rapidly with glycerol, affording a solid compd., $C_3H_5(O\cdot PbOH)_3$, which on heating at 120–130° to const. weight is converted into $Pb[O\cdot C_3H_5(OPb)_2O]_2$, which can be used in the detn. of glycerol. $Pb(OH)_2$ reacts very slowly, the reaction being accelerated by heat. PbO_2 does not react cold, but reacts rapidly when heated; $PbSO_4$, $BaSO_4$, and lithopone are without action on glycerol. ZnO reacts more slowly than red lead, but faster than white lead. In addn. to their advantages in covering power, lead pigments thus possess advantages in their reactivity towards decomposition products formed in the drying process. B. C. A.

Sublimed blue lead. D. S. MOSBY. *Paint, Oil, Chem. Rev.* **86**, No. 1, 18–9 (1928).—The chem. compn., phys properties, manuf. and paint characteristics of sublimed blue lead are reviewed. Photomicrographs show the comparison of this pigment with red lead with regard to uniformity of size and shape of the particles. R. J. M.

Constitution of ultramarine. E. GRUNER. *Z. angew. Chem.* **41**, 446–50(1928).—A review of the various theories of the constitution and of the cause of the color of ultramarine. B. C. A.

Mineral black. H. M. LANGTON. *Ind. Chemist* **4**, 311–4(1928).—Mineral black is one of the very few naturally occurring black pigments. In Bavaria, the Tyrol, Spain, Italy, Switzerland and U. S. A. (Penn.) it is made by grinding and levigation or wet-grinding of a highly carbonaceous shale or slate. The pigment is usually blue-black or brownish black. Around Bideford in Devonshire the mineral occurs in a pasty form. An account of the geology and the history of these deposits is given, also an account of the method of mining. Analyses of the product obtained by different methods, its phys. properties, and its appearance under the microscope are set forth. A discussion of its behavior as a paint pigment, as a cement pigment, as a rubber reinforcing pigment, in tile manuf., and as a pigment in the manuf. of tarpaulins, linoleum, paper and vulcanite concludes the article. A bibliography of literature on mineral black and related black pigments is included. E. G. R. ARDAGH

Recent improvements in the quality of American lithopone. JAMES E. BOOGE. *Paint, Oil, Chem. Rev.* **86**, No. 1, 18b-c(1928).—Lithopone production is now over 175,000 tons a year and has passed both white lead and ZnO. Recent improvements in texture and ease of mixing are reviewed. *Texture* is defined as freedom from coarse material, grit, hard aggregates, etc. Three tests for hiding power in general use are outlined, *viz.*, indirect tinting strength, cryptometer and paint-out test. The latter is pre-

ferred and a method given. Relative hiding powers so detd., with lithopone as 100, are as follows: American process ZnO 85–90, titanox 120–135, 50% ZnS lithopone 135–140; ZnS and TiO_2 run between 200 and 300. Methods for testing texture and ease of mixing are given. R. J. Moore

Bleaching of linseed oil. K. Würth. *Farben-Ztg.* **33**, 1852–3(1928).—Linseed oil was treated with ozonized air, a large, moving surface of oil being exposed during the process. The oil was rapidly bleached and its consistency unchanged, but on gentle heating, the oil assumed a brownish color and a gas having a strong odor was evolved. Similar results were obtained by treating the oil with air while exposed to ultra-violet light from a Hg lamp. The presence of moisture in the air or in the oil may influence the processes involved. B. C. A.

Varnish resins in the Far East. A. F. Suter. *Oil Colour Trades J.* **74**, No. 1561, 777–8(1928).—These notes of an extended tour for the purpose of studying the origin of various varnish resins deal with the damars and copals of Ceylon, Federated Malay States, Dutch East Indies, Sumatra, Java, Celebes and Borneo. R. J. Moore

Lacquer and varnish films. P. S. Kennedy. *Wood Industries* **50**, 1–6(1928).—Varnish- and lacquer-film failures on wood are identical as to fracture. The same phys. causes produce both. Each type is definitely recognized. Varnish-film fractures may return to their original state; lacquer-film fractures never. Cracks can be detected under the microscope in $^3/_4$ of the time before becoming macroscopic. Varnish dries to a plastic film; lacquer dries to a tight film. Varnish is always increasing in vol., whereas a lacquer film is decreasing. Easy-rubbing nitrocellulose lacquer is unsuitable for durable service on wood. Humidity cracks are possible with nitrocellulose lacquers, and improvement in this respect is possible by use of elastic lacquer for undercoats with varnish for topcoats, use of a combination varnish-lacquer product, or the use of a lacquer with a suitable synthetic plastic base. The term lacquer should refer only to quick drying and hardness; not to the components. It is possible to produce a synthetic lacquer material resistant to ultra-violet rays and one which resists the workings of wood both in and out of doors. E. M. Symmes

Nitrocellulose lacquers. S. S. Smith. *Ind. Australian Mining Standard* **79**, 490(1928).—A review from the English viewpoint. E. M. Symmes

Duco—a product of management. W. A. McGarry *Management* **31**, 37–42 (1928). E. M. Symmes

Constitution of colors (Heyl) **25**. Formaldehyde (Coulouma) **10**. Esters of glycolic acid (Ger. pat. 463,139) **10**. Painting silk (Can. pat. 283,227) **25**. Repairing cracked patent leather (Brit. pat. 283,995) **29**.

Luttringer, A. D.: **La linoxyne et le linoléum.** Encyclopédie du Caoutchouc et des Matières Plastiques. Paris: A. D. Cillard. 169 pp. F. 36.

Smith, S.: **The Cellulose Lacquers.** London: Sir Isaac Pitman & Sons, Ltd. 145 pp. 7s. 6d.

Paint. Liebeskind Williams. Can. 282,463, Aug. 14, 1928. A white paint contains 92.3% Zn, 2.3% Na_2CO_3, 3.1% flowers of S, 1.5% NaCl and 0.8% ultramarine blue by wt., fused, finely ground and mixed with a vehicle. Cf. *C. A.* **22**, 1486.

Paint vehicles and fillers. W. T. Branscombe and R. C. L. Everleigh. Brit. 283,998, July 24, 1926. An oily vehicle such as linseed oil and turpentine carries in suspension a pore-filler made by treating blown linseed oil or other suitable fatty oil with a small proportion of S or S chloride.

White lead. Holzverkohlungs-Industrie A.-G. Ger. 463,938, July 19, 1928. A basic lead acetate soln. contg. less PbO than is required for the prepn. of $Pb(OH)_2$-$2PbCO_3$ is pptd. with carbonates and refluxed with stirring. The product corresponds to chamber white lead in all properties.

Primings, varnishes, paint vehicles. William T. Branscombe and Richard C. L. Everleigh (to Pinchin Johnson & Co., Ltd.). Can. 281,837, July 17, 1928. A priming material, varnish or paint vehicle consists of a fatty oil (linseed oil) treated with S or SCl_2. The reaction is controlled to prevent coagulation by diln. with turpentine, the mass before becoming too stiff having added thereto a thinning agent, and driers, varnish, resins or a mixt. thereof.

Solvents for use in nitrocellulose lacquers, etc. J. Schindelmeister. Brit. 283,619, Oct. 6, 1926. Esters of borneol, isoborneol or terpineol such as the formates, acetates, butyrates, oxalates, phthalates and salicylates are used as solvents or colloid-

ing agents, alone or with other substances such as EtOH, PrOH, BuOH or AmOH, cyclohexanol, C_6H_6 or toluene. Synthetic resins, natural resins, coloring substances, fillers, etc., may be added to the compns.

Nitrated carbohydrate solution. GARRETT H. PETERS (to Hercules Powder Co.). Can. 283,058, Sept. 4, 1928. In a non-blushing soln. contg. nitrated cellulose and volatile constituents including a solvent and diluent the volatile ingredients of the soln. are substantially immiscible with water. *E. g.*, a soln. for use as a *lacquer* contains 10.5 parts nitrocotton on the dry basis, 30 parts butyl acetate, 45.5 parts toluene, 7.5 parts ester gum and 5 parts tricresyl phosphate.

Waterproofing paste. GERALD B. DYDE. U. S. 1,684,086, Sept. 11. A waterproofing paste suitable for use on leather, canvas or imitation leather is formed of boiled linseed oil 1 gal., turpentine 1 pint, Burgundy pitch 1 lb. and yellow beeswax 1 lb.

Furnace (with an endless conveyor) for use in lacquer enameling, etc. ALLGEMEINE ELEKTRICITÄTS-GES. (to International General Electric Co.). Brit. 283,591, Jan. 15, 1927.

Linoleum. C. F. HUMPHREYS and J. C. MCCARTHY (to Armstrong Cork Co.). Brit. 283,947, Jan. 22, 1927. A sheet of linoleum which may comprise a backing and a layer formed of ground cork, wood flour and linseed oil is indented with a pattern by use of a ribbed embossing plate. Various mech. features are specified.

Synthetic resin. AUGUSTUS E. MAZE. U. S. 1,683,835, Sept. 11. Diacetone alc. 1 and CH_2O 3 mol. proportions are caused to react in the presence of an alkali such as NaOH to form a product which is sol. in esters and ketones.

Synthetic resins. M. T. HARVEY. Brit. 283,803, Oct. 11, 1926. Cashew nut shell oil is condensed with an aldehyde such as CH_2O, with or without the presence of HCl or a basic catalyst. An oily product may be first obtained by use of temps. of 100–200° and this product may be further heated under pressure to obtain a hard compact material. The products may be used for *lacquers, elec. insulating*, etc.

Artificial resin. FRITZ SEEBACH (to Bakelite G. m. b. H.). U. S. 1,683,701, Sept. 11. A condensation product formed from a phenol, CH_2O and aniline, toluidine, α- or β-naphthylamine or other suitable aromatic amine, is fusible and sol. in org. solvents, contains about 77–78% C, 5–6% H, 4% N and has a mol. wt. of 370–380. Cf. *C. A.* **22,** 3308.

Manufacture of products from artificial resins. "RESAN" KUNSTHARZFABRIC A.-G. Austrian 108,680, Sept. 15, 1927. A bakelite or other artificial resin in the liquid state is poured over a shaped impermeable base and is hardened thereon. The base may be made of porcelain, glass, or a readily fusible alloy, and in the last case the base may be removed, when the resin has hardened, and be replaced by wax or other suitable filling.

Ester resins. I. G. FARBENIND. A.-G. (Gerhard Balle, inventor). Ger. 463,842, July 19, 1928. Acetylene is passed into resin acids, *e. g.*, colophony or Manila copal, fused or in solvents, *e. g.*, Me_2CO with or without catalysts, *e. g.*, $Hg(OAc)_2$, at ordinary or high temp. The ester resins obtained are sol. in ordinary lacquer solvents and in fatty oils and have high drying power.

Purifying soluble phenol-aldehyde resins. FRITZ SEEBACH (to Bakelite G.m.b.H.). U. S. 1,683,702, Sept. 11. A colloidal soln. is formed of the resins with alkalies in a quantity insufficient for transforming the resins into their alkali metal salts but sufficient for neutralizing the free phenols and avoiding the hydrolysis of the phenol alkali salts formed; the resins are then pptd. by water. Cf. *C. A.* **22,** 3792.

Resin-like condensation products from amines of the aromatic series and formaldehyde. I. G. FARBENIND. A.-G. Ger. 452,009, Nov. 2, 1927. *o*-Toluidine (107 parts) dissolved in the same quantity of 90% alc. is mixed for several hrs. with 100–120 parts of 30% CH_2O. An oily reaction product seps., which is freed from alc., H_2O, *o*-toluidine and other by-products by gradually heating under vacuum up to 180°. The yield is 90% based on the toluidine. The resulting product is like colophony; it softens at 50°. Aniline (200 parts) is dissolved in 320 parts of 94% alc. and stirred below the boiling temp. for 1.5 hrs. with 225 parts of 30% CH_2O. The process is completed as above. Other examples are: 30 parts of a mixt. of chlorotoluidine isomers, 60 parts of 90% alc. and 30 parts of 30% CH_2O; 150 parts α-naphthylamine dissolved in 300 parts of 94% alc. and 120 parts of 30% CH_2O; 150 parts β-naphthylamine in 450 parts of 94% alc. and 160 parts of 30% CH_2O.

27—FATS, FATTY OILS, WAXES AND SOAPS

E. SCHERUBEL

The deterioration of fats and the development of rancidity. W. L. DAVIES. *Ind. Chemist* **4,** 269-72(1928); cf. *C. A.* **22,** 3308.—Rancid aromas and flavors are due to the products of autocatalytic oxidation. Measuring the O_2 absorbed gives a time-O curve usually showing a period of induction followed by logarithmic absorption. The keeping quality of a fat may be deduced from this period of induction. Values for comparing the keeping qualities can be obtained by working at 70-85° to shorten the time required to secure the information, though the fats themselves are stored at 0° to 15°. The first step in oxidation is the formation of a fat peroxide at the position of the double bond in the unsatd. acids. This will form H_2O_2, which in turn will oxidize traces of $C_3H_5(OH)_3$ to aldehydes and hydroxy aldehydes. At the same time unsatd. acids will break down to simpler acids and aldehydes, or simpler acids may be partly oxidized by β-oxidation to ketones. The oleic residue can take up O_2 again, so that the process is autocatalytic. An acid condition of the original fat favors development of rancidity. Moisture, high temp. and light all hasten rancidity. Air should be kept away as much as possible. Traces of metals (except Sn) present as soaps in the fat are catalysts to oxidation, even in absence of light. Containers for strong fats should, therefore, be tinned or lacquered. Cu is the most active of the metal catalysts of oxidation, and Sn and Al are the least active. The following tests for rancidity are given in detail: (1) the Kreis test; (2) oxidizability of water-sol. constituents and of steam-volatile constituents; (3) hydroxy acids of high mol. wt. Color tests are given for detecting min. traces of Cu and Fe. Cu is 12 times as active as an oxidation catalyst as Fe. The development of rancidity by microörganisms is discussed. The presence of nitrogenous compds. hastens the outset of biologically induced rancidity. The fishy odor and flavor of butter are due to the Fenton oxidation of the choline to trimethylamine and aminoethyl alcohol. The glyoxal, formed by the partial oxidation of glycerol, acts in a similar way to a peroxide. Thus this compd. helps in the splitting off of NH_3 and catalyzes the onset of rancidity. Formation of NH_3, together with fatty acids, tends to keep the aq. phase neutral, at the same time causing a higher concn. of oxidizable compds. in the aq. phase. Too alk. a medium will cause more sapon. than an acid medium, and hence will hasten rancidity. This is particularly the case when Na and K soaps are present, though Ca soaps have little effect. The use of refined oils free from nitrogenous impurities does away completely with rancidity in soaps. Traces of the heavy metals produce discoloration in soaps. Antioxidants will prolong the period of induction and retard the subsequent rate of oxidation. Especially effective antioxidants are basic unsatd. compds. such as amines, aromatic phenols and inorg. basic reducers (*e. g.*, $SnCl_2$ and $Na_2S_2O_3$). These inhibitors retard or prevent oxidation only for a time. Subsequently the speed of oxidation is the same as before. The oxidation of rubber during aging and curing is closely related to the oxidation of fats. The use of antioxidants finds more application in the rubber than in the oil industry. Bibliography. E. G. R. ARDAGH

A new characteristic of coconut fat (caprylic acid number). J. GROSSFELD. Govt. Food Research Inst., Berlin. *Z. Untersuch. Lebensm.* **55,** 354-75(1928).—The *caprylic acid number* is detd. on 500 mg. of fat and is the amt. of fatty acid expressed as cc. of 0.1 *N* soln. in 5 g. fat and sepd. by fixed diln. of the soap solns. by $CuSO_4$ to form Cu salt. By this procedure the caprylic acid no. of coconut fat ranged from 17.4 to 21.8; palm-kernel fat 7.9 to 11.6; butter fat, 4.1 to 5.9; lard 0 to 0.3; and cacao fat 0. The technic is fully described. The test should serve to identify coconut oil. C. R. FELLERS

German practice in recovery of wool grease. ERNEST WOLFF. *Chem. Met. Eng.* **35,** 473(1928).—The alk. soap liquors from the wool scouring are mixed with H_2SO_4 and run into successive pits through which they flow continuously and sep. a sludge contg. wool fat, fatty acids of the soap and dirt. The sludge gradually fills the pits, from which it is pumped into a brick-lined tank, where it is heated previous to filtering. The filtered mud is heated and run into extn. app., where it is treated with benzine. Five extns. are necessary and the last 3 are used for further extn. Neutral grease is produced from the evapn. of the benzine soln., the benzine being recovered. The grease is refined by NaOH and alc. and the fatty acids are recovered. Lanolin is made by evapg. the benzine soln. to 0.8 sp. gr. and bleaching with fuller's earth, after which the benzine is recovered. The lanolin is deodorized. E. SCHERUBEL

Behavior of fats and oils in ultra-violet light. M. HAITINGER, H. JÖRG AND V.

REICH. *Z. angew. Chem.* **41**, 815–9(1928).—The fluorescence colors under ultra-violet light of several oils and fats, pure and in soln., are recorded, with reference to the detection of adulterants in butter, lard, cacao butter, olive oil, etc. A characteristic zoned fluorescence is noted when filter paper partially immersed in oil or oil soln. is satd. by capillary rise of the liquid. B. C. A.

Determination of the iodine number by means of thiocyanogen. H. STADLINGER. *Pharm. Ztg.* **73**, 340–2(1928); cf. *C. A.* **22**, 1488.—The comparatively new application of $(CNS)_2$ in the evaluation of fats is described, and applications of the procedure are indicated and discussed. The method involves addn. of the reagent (made up of specified amts. of Br, CCl_4, AcOH and $Pb(CNS)_2$) in excess to a weighed amt. of the fat, keeping the resulting mixt. 24 hrs. in the dark, then detg. the excess of reagent by addn. of KI and titration of the liberated I. The results, being expressed in terms of I, are comparable with the ordinary I values. Since $(CNS)_2$ unites only with 1 double, not with a triple, linkage and then only when 2 or more double linkages are present in the mol., a comparison of this thiocyanate value with the ordinary I value readily affords a means for detg. the nature and amts. of the several unsatd. compds. present. W. O. E.

Determination of halogen number by the aid of aqueous solutions. ALBERT HANSON. *Dansk. Tids. Farm.* **2**, 89–112, 112–3(1928).—The meaning of the halogen no. and its use in the detn. of degree of unsatn. and positions of double bonds are briefly discussed. The different methods of detg. the halogen no., Hübl's, Hanus, Wijs' and Winkler's, are described and discussed in considerable detail; whence both the desirable and undesirable features are pointed out. Winkler's method possesses several advantages over the others, and is therefore investigated further. Some of the faults pointed out by several investigators are the sensitivity to light, loss of Br_2, and low results on oils with high halogen no. Mixt. I was the one suggested by Winkler, *e. g.*, 25 cc. 0.2 N $KBrO_3$ + 10 cc. CCl_4 + 1 g. KBr dissolved in 15 cc. H_2O + 10 cc. 10% HCl soln., and Mixt. V was the same as I, except 5 g. KBr instead of 1 g. Expts. were made on olive oil (halogen no. = 84.5), linseed oil (h. no. = 175), and cod-liver oil (h. no. = 157.6) as detd. by Hübl's method. The results were: (1) Intermittent shaking of the reaction bottle is not necessary. (2) Less Br_2 loss occurs with Mixt. V than with Mixt. I. (3) The reaction period, when Mixt. V is used, must be 2 hrs. for non-drying oils, and 20 hrs. for drying oils. Prolonging the periods gave no appreciable increase in Br_2 consumption. The above periods gave results that agree with Hübl's. (4) The halogen used should be 40–50% in excess of the amt. required and may be calcd. from $(B - A)/B \times 100$; B = original amt. of halogen and A the amt used, as expressed in cc. 0.1 N $Na_2S_2O_3$, also the weight in g. of oil taken should be 33 ÷ approx. halogen no. (5) The addn. processes and the substitution processes, the latter hastened by light, do not take place simultaneously. At first the greater part of the addn. process takes place and when this becomes slower, *e. g.*, when there is an excess Br_2 in the CCl_4 layer, substitution starts. With the wt. in g. of oil = 33 ÷ approx. halogen no., the soln. is not sensitive to light for 8–10 min. (6) A lightproof box in which the reaction bottle may be placed during the expt. is described. (7) Hanus' method is only very slightly sensitive to light. (8) It was found that adding I_2 to a soln. of Br_2 in CCl_4 produced an increased light absorption at 600–400$\mu\mu$. (9) Addn of KI to the reaction mixt. decreases the sensitivity to light somewhat, but certain disadvantages follow, making this method of improvement questionable. (10) A different solvent was tried, *e. g.*, 5 cc. ether, 5 cc. CCl_4, and as reagents 25 cc. 0.2 N $KBrO_3$ in which 0.30 g. KBr and 0.415 g. KI were dissolved. The halogens were liberated by addn. of 7 cc. 25% HCl. A drop of NaOH soln. makes this soln. very stable. With this method, the sensitivity to light is practically overcome; the time for drying the oil is reduced to 6 hrs. The results are very good if at least a 40% excess of halogen is used. However, the amt. of oil must be almost exactly 33 ÷ approx. halogen no or unreliable results are obtained. H. does not wish to substitute this method for Winkler's, because the excess of halogen, and the weight of oil sample must be within such narrow limits as to make it difficult of consistent results. O. A. NELSON

Hydrogenation of polymerized oils. I. LARYUKOV. *Oil and Fat Industry* (Russia) **1928**, No. 1, 27–8.—Consumption of H is considerably decreased when the hydrogenation of polymerized oils is carried out at a temp. of 300–315° for 40–50 min. The hydrogenated oil obtained is of the same quality as the low-temp. hydrogenated oil. A. A. BOEHTLINGK

Analysis of sulfonated oils. W. H. THOMAS. *Am. Dyestuff Rept.* **17**, 587–9 (1928).—Details for detg. the H_2O and ash are given and also for the titration methods ...m. Leather Chem. Assoc. L. W. RIGGS

A few notes on fish oil. JOSÉ SAMPAIO MOREIRA. *Chimica e industria* **2**, 413–6, 439–41(1927).—Review without references. MARY JACOBSEN

Color-glass standardization. D. B. JUDD AND G. K. WALKER. *Oil and Fat Ind.* **5**, 16–26(1928).—A large no. of red Lovibond glasses for grading vegetable oils were compared with a standard glass and graded by means of a Martens photometer. The engraved numerals were found to be only an approx. index of color, previous findings as to inaccuracies in the region 7.0–8.0 being confirmed (samples engraved 7.6 covering a range of 1.1 red units). Results indicated that the Priest and Gibson scale departed by about 0.1 from the av. Lovibond red glass of the order 7.0–8.0 used in the U. S. B. C. A.

Examination and evaluation of bees wax. E. ELSER. *Schweiz. Chem.-Ztg.* **1928**, 27–32, 40–5.—A precise method of detg. m. p. of waxes, using a 1.5-mm. capillary tube in a bath, the temp. of which is raised 4° per min. from an initial temp. not above 10–15°, is described. Tables are given showing the variation of m. p. of three fractions of beeswax when mixed with varying amts. of carnauba wax, ceresin, Japan wax, spermaceti, and paraffin waxes (m. 58° and 48°). Each wax is considered in some detail and its characteristic effect on the m. p. of beeswax demonstrated in a series of curves. The author concludes that modern chem. and physicochem. research has shown that the thermal method of analysis of beeswax is simple and exact, and permits the detection not only of the nature but the percentage of adulteration. B. C. A.

Standard analysis of soap. ANON. *Chem. Eng. Mining Rev.* **20**, 363–5(1928).—Directions are given for detg. moisture, insol. matter, total acids, resin acids, free alkali and matter insol. in alc., alkali carbonate and silicate. W. T. H.

Soap perfuming notes. ANON. *Perfumery and Essential Oil Record* **19** (Special No., Aug., 1928) 326–30.—The keeping quality of soaps and perfume material is reviewed. The following substances retard oxidation and should be used in soap perfumes: anisole, benzyl benzoate, borneol, carvacrol, citronellol, coumarin, cinnamon-bark oil, clove oil, cymene, eucalyptol, eugenol, guaiac wood oil, isoeugenol, isosafrole, phenylpropyl alc., patchouli and petitgrain oil, phellandrene, resins, safrole, sandalwood oil, thymene, thyme oil, thymol. The principles of incompatibility and stability of various substances are as follows: alcs. generally are stable as geraniol; the cinnamic and the aliphatic aldehydes are less stable and vary greatly; benzaldehyde is the most unstable; anisaldehyde is a little more lasting; vanillin is sensitive to light; heliotropin and the aliphatic kind are the most permanent. The ketones vary; the aromatic kind resist the action of light and alkali; artificial musks are stable but not to light; ionones easily polymerize. The aliphatic, as methyl nonyl ketone, are very lasting. Phenols form salts with alkali; some as eugenol are stable. The halogen compds., like bromostyrene, are fairly stable and reliable with alkali. The ethers, such as *e. g.*, Ph_2O and nerolin, are resistant to light and alkali. Esters are all saponifiable and only permanent in neutral soap. The lactones, such as coumarin, are reliable except against light. The acids, such as phenylacetic, benzoic and cinnamic, are stable. The terpenes are O carriers and form hydroxy fatty acids. The general principle followed for constructing perfume formulas is to rough out a formula of the stable primary materials; where they are not all stable a protective agent is added either by way of a fixative or a combined modifier and fixative of the same odor class. The modifiers are then added; but the fixative is the most essential factor and should always be on the generous side and preferably of the resinous kind. E. S.

Centrifugal mixers [for salting out of soaps and refining of fats] (BUHTZ) 1. Dependence of the chemical composition of oil-containing plants on the climate (IVANOV) 11D. Detecting spoiled or worked-over nutrient fats (GROSSFELD) 12. Determining absolute viscosity of oils, etc. (RAASCHOU) 2. Disintegration of the Ni catalyst (MASHKILLEISON) 2. Influence of area of active surface of a Ni catalyst on the velocity of hydrogenation of oils (JÓZSA) 2. Apparatus for treating oil (Can. pat. 283,501) 22.

Zeitschrift für physikalisch-chemische Seifenforschung. (New Journal.) Vol. I, No. 1. June, 1928. Edited by L. Zakarias, of Prague. Published monthly. Annual subscription 12 German Marks.

Extracting fat from bones of whale, seal and other large marine animals. AKTIESELSKAPET FORSÖKSDRIFT. Norw. 44,755, Jan. 16, 1928. Mech. features of process and app.

Sulfonated fats. HEINRICH BERTSCH (to H. Th. Bohme A.-G.). Can. 283,397,

Sept. 18, 1928. Sulfonation products are obtained by treating a polymerized fatty substance with H_2SO_4 in the presence of AcOH.

Extraction of oil from whale and seal speck. AKTIESELSKAPET FORSÖKSDRIFT. Norw. 44,463, Oct. 10, 1927. The speck is disintegrated by cutting or chopping in a suitable mech. app. and is heated to about 50° under reduced pressure until approx. half of its water content has been removed. By this treatment the physical condition of the cellular tissues is completely changed in such a way that the oil can easily be sepd. by pressing.

Extracting oil from fish liver and similar fatty materials. AAGE W. OWE. Norw. 43,956, April 25, 1927. The liver mass is frozen in order to burst the cellular tissues and is then thawed out again. The oil is sepd. by filtering, centrifugalizing or in other known ways. Before or after the freezing but before the thawing the liver is disintegrated in a mech. app. Cf. *C. A.* **21**, 2196.

Apparatus for the extraction of oil from fish liver ROLF RÖED. Norw. 44,190, July 4, 1927.

Boiler for the production of oil, etc., from whale flesh. THORALF SÖRLLE and KNUT T. FOSSHEIM. Norw. 44,158, June 27, 1927. Mech. features.

Recovering oil from tin plate, etc. AMERICAN SHEET & TIN PLATE CO. Brit. 283,614, Sept. 13, 1926. Palm oil or the like is removed from tinned plates suitably, by washing with an alk. soln. which forms an emulsion, the oil is sepd. from the bulk of the water, as by breaking the emulsion with acid or by the action of heat, and water is sepd. from the oil by vaporization before further use of the recovered oil. H_2SO_4, niter cake, waste pickle liquor, lime, $CaCl_2$, $FeSO_4$, Na_2SO_4 or alum may be used in breaking the emulsion, or the oil may be extd. with a solvent. An app. is described. Cf. *C. A.* **22**, 3389.

Separating oil from aqueous emulsions. AMERICAN SHEET & TIN PLATE CO. Brit. 283,830, Sept. 13, 1926. In sepg. oil such as palm oil from an emulsion with an alk. soln. (such as is obtained in recovery of the oil from tin plate as described in Brit. 283,614, preceding abstr.), enough alk. soln. is added to purify the oil partly, the emulsion is broken by addn. of an acid and the oil is sepd. from the broken down emulsion, *e. g.*, by gravity. An app. is described.

Soap. HANS HOFFMÜLLER VON KORNATZKI. U. S. 1,684,336, Sept. 11. A soap which is stated to be a "*remedy for rheumatism*" comprises 6 parts by wt. of a soap mixt. obtained from fatty oils such as palm, cotton and coconut oils and NaOH, together with 95% alc. 1, freshly prepd. rectified amber oil 1, and succinic acid 0.2 part. Cf. *C. A.* **21**, 3760.

Dye soap. WOLF KRITCHEVSKY and HAROLD C. PRUTSMAN (to William Citron, trustee). Can. 281,874, July 17, 1928. A dye is incorporated in the metallic salt of a sulfocarboxylic acid.

Detergents. I. G. FARBENIND. A.-G. Brit. 283,786, Oct. 13, 1926. Cleansing compns. and emulsifying agents forming clear aq. solns. suitable for use in the *textile* and *leather industries*, comprises the oily O-contg. org. substances insol. in water obtained by the hydrogenation of oxides of C or by the hydrolysis of the compds. formed by absorbing in H_2SO_4 the unsatd. hydrocarbons obtained by cracking, mixed with a soap or soap-forming materials or with substances such as turkey-red oil having "soap-like" properties. Solvents such as alcs. or hydrocarbons or paraffin or $C_{10}H_8$ may be added.

Detergent. ZIMMERER-WERK, CHEM. FABRIK. Ger. 451,986, Nov. 4, 1927. Two parts by wt. of pure extd. almond bran is mixed well with 2 parts of calcined kieselguhr and 1 part of pure soap powder. To this is added 1 part of a mixt. consisting of 3 parts of cyclohexyl acetate and 1 part of citronella oil. Cyclohexane may be used instead of cyclohexyl acetate.

28—SUGAR, STARCH AND GUMS

F. W. ZERBAN

Colloid chemical research work in the sugar industry during the past few years. P. HONIG. *Arch. Suikerind.* **36**, 591-612(1928).—A survey is presented of research work done by different chemists on colloid chemistry in sugar manuf. The expt. station in Java will study the different points in order to establish methods to be followed at the various stations in the factory. P. R. PEKELHARING

Rebuilding the sugar mill Redjoagoeng (Java). Q. A. D. EMMEN. *Arch. Suiker-*

ind. **36**, 520–9(1928).—Description of the elec. installation of the mills at Redjoagoeng.
P. R. PEKELHARING

Electrification of sugar mills. J. C. L. OLDIGS. *Arch. Suikerind.* **36**, 477–98 (1928); cf. *C. A.* **21**, 2571.—A discussion of the advantages of electrification, and a description of the installation at Wonopringo, Java. P. R. PEKELHARING

Drying of sugar products and determination of moisture. D. SIDERSKY. *Bull. assoc. chim. sucr. dist.* **45**, 247–9(1928).—Heating of samples in a capsule inserted in a tube through which dry air was passed and to which a $CaCl_2$ tube was attached showed that at 108° const. weight both of sample and of $CaCl_2$ tube could be attained in 2 hrs. with first-product beet sugars. With second and lower beet products the $CaCl_2$ tube reached const. weight in $2^1/_2$–3 hrs., but the samples underwent a slight further loss (about 0.1%) during the next hour. With raw cane sugars, constancy of weight could not be reached even in 6 hrs., probably because of slow decompn. of levulose. For exact detns. of moisture heating *in vacuo* below 95° is recommended, although the ordinary method serves well enough for com. analyses. B. C. A.

Seed cane. P. DE SORNAY. *Rev. agr. Maurice* **5**, 109–11(1928).—A plea is made for the use of sound cane tops, preferably from plant cane, carefully selected, and given a warm water treatment. They should be planted as soon as possible after being cut.
F. W. ZERBAN

Progress in the beet-sugar industry since 1924. O. SPENGLER. Inst. für Zucker-Ind., Berlin. *Z. angew. Chem.* **41**, 194–200(1928). E. H.

Accurate determination of dry substance in beet house sirup. R. J. BROWN, J. E. SHARP AND A. R. NEES. *Ind. Eng. Chem.* **20**, 945–8(1928).—Digest clean sea sand that will pass a 40-mesh but not a 60-mesh sieve in strong HCl, wash free from acid, dry and ignite. Place 25 to 30 g. of the sand in an Al dish with a short stirring rod and a cover. The dish is 50 mm. diam. by 35 mm. high. Stir into the sand about 0.5 g. powd. graphite free from oil. Dry the dish in an oven overnight, cool in a desiccator and weigh. Weigh into the dish from a weighing buret an amt. of sirup contg. from 0.5 to 0.7 g. dry substance. Mix the contents of the dish thoroughly and place in a vacuum oven which permits no appreciable air leak. Dry at 90° and at a pressure of 125 mm. or less in an atm. of dried CO_2, feeding about 3 or 4 cu. ft., at atm. pressure, per hr. to the oven. Heat the samples for 72 hrs. or more; remove from the oven, transferring the dishes quickly to individual desiccators contg. fresh P_2O_5; allow to stand in the desiccators 3 days or more, and weigh rapidly after removing from the desiccator. Exptl. evidence is presented for the necessity of each step adopted in the procedure. The max. difference between duplicate detns. was 0.06% on sirup. The method is applicable to all beet house products including those contg. raffinose, but it is not advocated for other than beet products. F. W. ZERBAN

Copper-reducing substances contained in beet roots and diffusion juice. L. BRANCOURT. *Bull. assoc chim. sucr. dist.* **45**, 251–4(1928).—In diffusion juice from beets which have been stored or slightly injured by frost or other influences, the Cu reducing power is not a sure measure of the invert-sugar content. Decompn. of cellulosic and protein constituents of the beets is liable to occur, especially in the last units of the diffusion battery, and give rise to reducing substances without a corresponding disappearance of sucrose. These reducing substances differ from invert sugar in that, with proper treatment of the juice, they are not so liable as the latter to give rise to colored substances on liming and evapn. In badly frozen beets the decompns. which set in after thawing result in the formation of viscous products. Reducing substances are then apt to occur in widely varying amts., and on liming they yield sol. Ca compds. The ppt. formed on carbonatation is thereby reduced in amount and of a character difficult to filter even when considerable amts. of Na_2CO_3 are used. In such cases the author recommends heating the juice to actual boiling, at least after the first carbonatation, and adding a granular form of $CaCO_3$ to assist filtration. B. C. A.

The development of the alkaline defecation-carbonatation process. Clarification tests by the Chemical Section of the Experiment Station (Java), in the years 1925 and 1926. K. DOUWES DEKKER AND P. C. NICOLA. *Arch. Suikerind.* **36**, III; *Mededeel. Proefstat. Java-Suikerind.* **1928**, 721–49.—An historical survey is given of the expts. made to find a clarification process better than sulfitation and cheaper than carbonatation. The new method was to be based on the theory of Van Nes, that the main point in clarification is the formation of a gel of silicic acid and calcium silicate, and that the effect of p_H and of the adsorptive power of $CaCO_3$ is secondary. The expts. were made partly at Djatiroto on a semitechnical scale, and partly at Gesiekan, where a regular installation was built. The 1st series of expts. at Djatiroto was made with freshly pptd. $CaCO_3$ prepd. outside of the juice. The raw juice was limed to phenol-

phthalein neutrality and heated to boiling. After cooling, milk of lime and freshly pptd. $CaCO_3$ were added and the juice was filtered. Though the increase in purity was satisfactory and the lime content of the juice low, the filtration rates were unsatisfactory. The object of the 2nd series of expts. was to show that a heavy ppt. of $CaCO_3$ must be formed in the juice to perform the dehydration of the gel. Therefore a large quantity of CO_2 had to be accumulated in the juice before lime was added. The best way to obtain this was to add lime to alky., then to carbonate to p_H 6.7 to form bicarbonate, and finally to lime to p_H 8.4 to form carbonate. The lab. expts. were carried out with pure CO_2, the semitechnical expts. with flue gases, but without satisfactory results. For the technical expts. at Gesiekan a special installation was built to prep. 100% CO_2. The tests at Gesiekan had to be stopped on account of technical difficulties, but will be continued during the 1928 campaign. So far nothing definite can be said regarding the effect of SiO_2 in clarification. The method used at Gesiekan was as follows. The cold juice was limed to phenolphthalein alky., then carbonated with pure CO_2 to an acidity of 1000 mg. CaO per l. To this liquid of 6.7 p_H contg. the lime as bicarbonate the main quantity of the lime was added, and $CaCO_3$ pptd.; the final alky. was 700–800 mg. CaO per l. After settling and decanting, the clear juice and mud were satd. with CO_2 and the clear juice was filtered. The mud after heating to 70° was allowed to settle for a 2nd time. The mud from this settling was heated to 90°, filtered, and the filtrate together with the 2nd clear juice was added to the acid juice just before the main quantity of the lime was added. P. R. PEKELHARING

Dextrose determination with alkaline iodine solution. K. DOUWES DEKKER. *Arch. Suikerind.* **36,** III; *Mededeel. Proefstat. Java-Suikerind.* **1928,** 699–720.—A practical method is sought for the detn. of dextrose in solns. contg. sucrose and reducing sugars, in order to det. the proportion between dextrose and levulose. A critical review of the different methods based on the alk. iodometric detn. of dextrose is given The modification by Auerbach and Bodländer (*C. A.* **18,** 800) of Romijn's method seems to be the most practical, but the amt. of I had to be increased. A series of expts. was made to study the time of the reaction, the alky., and the I concn. necessary. As pure dextrose was not available, the expts. were made with invert sugar prepd. according to the method of the A. O. A. C. The following method was finally adopted. Place 25 cc. of the soln. to be analyzed and contg. approx. 30 mg. of dextrose in a glass-stoppered Erlenmeyer flask. Add 10–15 cc. (0.33 to 0.5 of the mg. dextrose present) of 0.1 *N* I soln., and then 100 cc. of a buffer soln. contg. 14.7 g. $NaHCO_3$ and 2.95 g. Na_2CO_3 (93%) per l. Stopper the flask and put it in a dark place for 40 min. Acidify with 12–15 cc. 25% H_2SO_4 (1 part concd. acid and 5 parts H_2O), and titrate with 0.1 *N* $Na_2S_2O_3$ soln. Run a blank test with 25 cc. of H_2O and apply the correction. One cc. of 0.1 *N* I soln. is equiv. to 9.005 mg. dextrose. The results obtained with invert sugar are about 1.8% too high, and a correction may be applied for this if desired Another series of expts. was made to investigate the effect of sucrose on the detn of the dextrose. The best results were obtained at the same alky. as in the 1st series The reducing power of sucrose is 0.25% of that of dextrose. Therefore the limit of permissible sucrose concn. is fixed by the required accuracy of the result. The possible application of this method to factory products will be investigated. P. R. P.

Decomposition of sucrose by adsorbent carbons. E. LANDT. *Z. Ver. deut Zukerind.* **1927,** 834–40.—A mathematical exposition of Vasátko's results (*C. A.* **22,** 2287). H. G.

Some adsorption properties of bone char. T. B. WAYNE. *Ind. Eng. Chem.* **20,** 933–40(1928).—Elaborate expts. have shown that a layer of alk. substances adsorbed by char plays an important part in the removal of ash from sugar liquors, entirely apart from the effect of the mineral skeleton of the char itself. In actual refining practice ash adsorption may be increased by revivifying the char at the highest possible temp which avoids a p_H high enough to decrease decolorization materially or to produce darkening of the liquor. In any attempt to evaluate the ash-adsorbing qualities of chars it is necessary to consider the p_H of the char and of the liquor. At the beginning of a char filter cycle considerable invert sugar disappears, either actually or apparently, but a part of it is again released upon sweetening off. F. W. ZERBAN

The beginning of the mutual factory control in Java. H. C. PRINSEN GEERLIGS *Arch. Suikerind.* **36,** 613–21(1928).—Historical. P. R. PEKELHARING

Mutual comparison of factory results. P. HONIG. *Arch. Suikerind.* **36,** 621–5 (1928).—The advantages of such a system are pointed out. P. R. PEKELHARING

Interest in the mutual factory control. C. SYLMANS. *Arch. Suikerind.* **36,** 626–37 (1928).—A reply to various criticisms of the "technical result" figure which has lately been introduced in Java as a measure of factory efficiency. P. R. PEKELHARING

Experimental molasses station at the sugar plant in Gniezno. T. Sliwinski. *Przemysl Chem.* **12,** 102–6(1928). A. C. Z.

Rotating S burners (Alewyn) **18.** The acidity of soil for sugar cane (Arrhenius) **15.**

Extracting and purifying saccharine juices. K. Komers and K. Cuker. Brit. 283,564, Jan. 14, 1927. Beet slices or like materials from which juices are to be extd. by lixiviation are preliminarily treated with finely divided substances such as active C, pulverized coke, cellulose, hydrocellulose, metals, metal oxides or salts to increase their active adsorption surfaces in contact with the crystalloid soln. to be purified. An app. is described.

Purification of crude sugar juice with lime and sulfurous acid. Johannes Manschot and Willem Appel. Dutch 18,227, July 16, 1928. The process is an improvement of the hot sulfitation process for cane juice. Sufficient acid juice is run into a vessel with milk of lime to make it weakly acid or neutral. It is then heated to 80° (physical purification) and transferred to a cylindrical vessel, where SO_2 can be passed through it from the bottom center, inducing juice circulation up through an axial pipe open on both ends inside the cylinder. More lime is added in the outside space so as to give difference in reaction (weakly alk. and acid) simultaneously in different parts of the cylinder (chem. purification). The end result is an acid juice of 120 mg. SO_2 per l. of good clarity and easily filterable.

29—LEATHER AND GLUE

ALLEN ROGERS

Ettore Andreis, 1860-1928. Leopold Pollak. *Gerber* **54,** 124(1928).—An obituary. H. B. Merrill

Progress in the field of tanning chemistry and technic. O. Gerngross. Techn. Hochschule, Charlottenburg. *Z. angew. Chem.* **41,** 221–6, 254–62(1928). E. H.

Value as a tanning material of the bark of "Cay-Duoc-Sanh" of Cochin China. F. Heim de Balsac. *Halle aux cuirs* **1928,** 217–53.—This bark, variously identified as *Rhizophora mucronata* Lamk or *R. conjugata* L., is readily extractable, and gives an easily filtrable ext., which produces satisfactory leather. Analysis of the bark showed: H_2O 13.9, insol. matter 58.7, tannin = 16.4, and non-tannin = 11.0%. Because of the relatively low tannin content and the relatively high proportion of non-tans, this species has less possibilities than other similar plants. H. B. Merrill

Chrome tanning. IX. 6. A bibliography of chrome tanning. Donald Burton. *J. Intern. Soc. Leather Trades Chem.* **12,** 337–42(1928); cf. *C. A.* **21,** 1028. H. B. M.

Tanning products derived from the manufacture of wood cellulose. René Escourrou. *Halle aux Cuirs* **1928,** 203–14, 234–46; cf. *C. A.* **22,** 4002.—Sulfite cellulose liquors are treated by 1 of a no. of enumerated processes, and evapd. either to dryness or to a thick sirup. The resulting ext. contains lignosulfonic acids, akin to syntans; they resemble syntans in properties and uses. Analyses of 3 solid and 13 liquid exts. are given. In addn. to insol. matter, sol. matter, non-tans and tans, important characteristics are titrable acidity, p_H value and ash. Ash in samples analyzed varied from 1.5 to 14.2%, according to completeness of elimination of CaO from sulfite liquor. High ash is objectionable. Slight acidity is desirable, but the presence of free H_2SO_4 or HCl is objectionable. Fluorescence of sulfite cellulose tanning exts., which resembles that of syntans, is too variable to be used as a qual. means of detection. Uses: (1) To aid in dissolving such natural tanning materials as quebracho. (2) In tanning, mixed with natural tanning materials, to obtain quicker penetration, cleaner liquors, brighter colored leather and higher yield. (3) In retanning, mixed with natural tanning materials, to obtain a firmer leather. Mixts. of sulfite cellulose ext. with syntans are in themselves satisfactory tanning materials, neither of which is satisfactory alone. The employment of sulfite cellulose is desirable as a means of conserving vanishing natural tanning materials. H. B. Merrill

Fractional salting out of vegetable tan liquors. N. Kotelnikov and I. Bass. *Vestnik* (Organ of the All-Russian Leather Synd.) **1927,** 57–8; *Collegium* **1928,** 366.—The coagulation of tannin by salt is reversible. The existence of the sol state is detd. not by the ratio of electrolyte to dispersed material but by the concn. of electrolyte in the soln. Analyses of cold- and of hot-extd. badan liquors showed no difference in tannin concn., but the cold-extd. liquor contained more material non-precipitable by NaCl, and is therefore better adapted to the first stages of tanning. H. B. Merrill

Nature and prevention of salt stains. I. Kaplan and M. Luxemburg. *Vestnik* (Organ of the All-Russian Leather Synd.) 1927, 58–60; *Collegium* 1928, 428.—A review.
H. B. Merrill

Application of scientific principles to the soaking of hides. Frederick L. Hilbert. *Hide & Leather* 74, No. 11, 30–1(1927), *et seq.*—A discussion. H. B. Merrill

Storage of raw hides. I. Lokshin and M. Luxemburg. *Vestnik* (Organ of the All-Russian Leather Synd.) 1927, 236–9; *Collegium* 1928, 428–9.—Methods of handling skins in proposed central storage houses are described. Skins as received are (1) drained 2 hrs., (2) washed in a drum and again drained, (3) brined for 10 days, and (4) piled in packs of 250 heavy or 2000 light pieces. H. B. Merrill

Raw skin damage. A. Dyakov and M. Luxemburg. *Vestnik* (Organ of the All-Russian Leather Synd.) 1927, 240–4; *Collegium* 1928, 429.—The center splits from heavy calf skins showed holes of various sizes, although the grains and fleshes were not damaged. The damage is detectable after unharing, in the form of red spots, visible by transmitted light, from which a yellow liquor can be expressed. The trouble is attributed to autolysis during storage, and is said not to be of bacterial origin.
H. B. Merrill

Raw skin damage. A. Shcherbak. *Vestnik* (Organ of the All-Russian Leather Synd.) 1927, 290; *Collegium* 1928, 430; cf. preceding abstr.—Damage similar to that above described was noted in tanning with exhausted and foul liquors during a tannin shortage. The trouble was stopped by disinfection of vats and employment of sufficient strong ext. H. B. Merrill

Depilation of skins by means of alkaline solutions. Robert H. Marriott. Brit. Leather Manuf. Research Assocn., London, Eng. *J. Intern. Soc. Leather Trades Chem.* 12, 216–34, 281–303, 342–60(1928).—The theory is maintained that unhairing is brought about by 2 purely chem. reactions: (1) hydrolytic breaking down of keratin, catalyzed by OH, and (2) action of reducing agents on cystine group, rendering keratin sol. This reduction takes place only at $p_H > 11$. Unhairing expts. with dried goat skin showed that addn. of KCN, Na_2SO_3 or $FeSO_4$ to satd. $Ca(OH)_2$ soln. contg. excess solid $Ca(OH)_2$ accelerated unhairing. Slight acceleration was noted in old limes contg. reducing substances derived from skin or hair, and in air-free limes, as compared to ordinary $Ca(OH)_2$ solns. KCN has a sharpening action about equal to Na_2S. Sharpening action of Na_2SO_3 is partly due to increased OH concn. Addn. of $Fe_2(SO_4)_3$ or $K_2S_2O_8$ to lime inhibits unhairing. Addn. of KCN or Na_2SO_3 to dil. NaOH gave solns. of enhanced depilatory power. Hair soaked in these solns. gave a pink test for —SH with nitroprusside, indicating reduction of cystine to cysteine. Previous soaking of dried goat skin in dil. NaOH + Na_2SO_3 accelerates subsequent unhairing in $Ca(OH)_2$, but only if p_H of soak > 11. Action of OH on hair was studied by soaking human hair in borate-NaOH buffers of p_H = 8–13 for 2, 5 and 7 days, and detg. dissolved N. p_H value has practically no effect up to p_H = 11–12, above which hydrolysis of hair is noticeably increased. Making liquor 0.1 *N* in Na_2SO_3 had no effect on N dissolved up to p_H = 11. Hair previously soaked in these alk. solns. was treated with approx. 0.25% Na_2S for 20 hrs., and dissolved N detd. Hair pretreated at $p_H > 11$ is less acted on by Na_2S than hair pretreated below p_H = 11, because of previous destruction of the —S—S— group by alkali. Pretreatment of hair with Na_2SO_3 had no effect on subsequent action of Na_2S. Solns. of cystine are fairly rapidly decompd. by $Ca(OH)_2$, as demonstrated by formation of NH_3. Na_2S retards decompn. of cystine to NH_3 by lime. Gelatin is only slowly decompd. to NH_3 by lime; and the presence of Na_2S does not affect reaction. Most of the NH_3 found in lime liquors is probably formed from cystine. Presence of cystine in lime liquor accelerates the decompn. of gelatin slightly, and the presence of both cystine and Na_2S accelerates decompn. of gelatin markedly. Cysteine is more rapidly broken down by lime than is cystine. Action of different alkalies at the same concn. on cystine is not the same. $Ca(OH)_2$ has greater action than any other alkali, including $Ba(OH)_2$ and $Sr(OH)_2$. Hydrolysis of collagen was studied by treating purified ox corium with various alk. solns. at 22–23°, and detg. (1) free NH_3, (2) total dissolved N after 14, 28, 56 and 112 days. Most of the NH_3 formed is liberated at the outset, while total N increases linearly after initial rapid increase, probably because of soln. of easily hydrolyzed material. Hair is more completely decompd. by $Ca(OH)_2$ alone than is collagen for any given digestion period. Addn. of hair and of cystine to the system: collagen - $Ca(OH)_2$ did not increase decompn. of collagen. Na_2S had less action on collagen than $Ca(OH)_2$. The enhanced depilatory power of old limes is ascribed to reducing substances formed by action of liquor on skins previously passed through it. The mol. mechanism of the action of sulfides and of alkalies on cystine is discussed. H. B. Merrill

The hydrolysis of leather. G. Arbuzov. All-Russian Leather Synd. Expt. Sta.,

Vestnik (Organ of the All-Russian Leather Synd.) **1927,** 337–42; *Collegium* **1928,** 365–6; cf. *C. A.* **22,** 2486.—Three sole leathers tanned, resp., with oak, quebracho and oak-quebracho mixts., were investigated. Samples were hydrolyzed by continuous and intermittent heating on the water bath. Conclusions: (1) Leather is a system not in equil. (2) During hydrolysis, especially in leathers not uniformly tanned, there takes place a rearrangement of uncombined or loosely combined tannin, resulting in an equil. between the solid and liquid phases. (3) In the equil. state brought about by hydrolysis a chem. compd. exists. The equil. relationships between protein and tannin are different for different tanning materials. (4) In treating leather with MeOH, some replacement of tannin by alc. may occur. (5) Previous treatment of leather by alc. does not change the wt. relationships between hide substance and tannin existing in the hydrolysis products. Upper leathers gave hydrolysis products of const. compn. independent of duration and method of hydrolysis, but different from the hydrolysis products of sole leather. [Note: Data on which these conclusions are based are not available to the abstractor.] H. B. MERRILL

Sulfonated oils and their action on leather. A. DEFORGE. *Halle aux cuirs* **1928,** 228–34.—A review of recent work. H. B. MERRILL

Exterior factors influencing the destructive action of acid in leather. A. DEFORGE. *Halle aux cuirs* **1928,** 196–201; cf. *C. A.* **22,** 3063.—A review of the work of Wilson and Kern on the influence of relative humidity, and of the work of Veitch, Frey and Leinbach on the influence of atm. pollution. H. B. MERRILL

Indigosol dyeing and printing of hides. J. S. TURSKI AND J. ROSENZWEIG. *Przemysl Chem.* **12,** 173–5(1928).—Hides dyed or printed with indigosols retain their colors in light, sweat, water, rain or mud. Indigosols cause no weakening of the leather. In view of their color-fastness and the superiority of the colors indigosols should prove widely serviceable, and their cost should not prove an important impediment to development of their use. A. C. ZACHLIN

Efficiency of a tannery-waste-treatment works (SCHAETZLE, BLOHM) **14.** Water-soluble dyes [for leather] (U. S. pat. 1,684,330) **25.** Detergents [for use in the leather industry] (Brit. pat. 283,786) **27.** Derivative from ligninsulfonic acid (Can. pat. 282,677) **23.** Tanning agent from sulfite cellulose waste liquor (Ger. pat. 451,913) **23.** Waterproofing paste [for use on leather] (U. S. pat. 1,684,086) **26.**

Tanning skins and hides. JOHANNES HELL. Ger. 451,988, Oct. 31, 1927. One hundred kg. of hides is treated with 12 kg. of $CaCl_2$ and 5–6 kg. of $CaCO_3$. During the tanning 0.1 kg. of quinone is gradually added. The treatment is allowed to run for 20 hrs. The $CaCl_2$ can be replaced with 15 kg. of $MgSO_4$ and the quinone replaced with 0.6 kg. of formaldehyde. $MgCl_2$ may be also used instead of $MgSO_4$.

Repairing cracked patent leather. J. J. NESTOR. Brit. 283,995, Oct. 16, 1926. The surface layer of the cracked portion is removed, a filler such as a mixt. of shellac, gum benzoin, MeOH or EtOH, poppy oil and coloring matter (or a mixt. which may be formed of carnauba wax with shellac wax, paraffin, ceresin and stearic acid) is applied, and a shellac or copal varnish or the like is then applied and the solvent evapd. by a blast of air. Nitrocellulose also may be used.

Cleaning leather goods and furs. ACHILLE SERRE, LTD., AND J. B. ARGENT. Brit 283,709, Dec. 11, 1926. The articles are tumbled in a rotating drum (of special construction, which is described) with hardwood sawdust or a mixt. of fine sand and wood dust to which may be added a small proportion of a non-inflammable solvent.

Glue or gelatin. JOSEPH C. KERNOT. Ger. 451,985, Nov. 21, 1927. Refuse, such as the skin, head, tail and bones of the fish, after washing with water is given repeated treatment with weak alkali or alkaline reacting salts. After again washing with water the refuse is treated with dil. acid, preferably H_2SO_4. It is again washed with water. The liquor resulting is concd. and allowed to solidify. The gelatin is cut into pieces and dried.

30—RUBBER AND ALLIED SUBSTANCES

C. C. DAVIS

The thermochemistry of rubber. SIEGFRIED BOSTRÖM. Univ. Giessen. *Kolloidchem. Beihefte* **26,** 439–70(1928).—The work consists of 3 parts: (1) the development of a method for detg. the "activity" of technical pigments and filler; (2) the thermodynamics of the Joule effect in rubber and (3) an investigation of the thermochemistry

of the vulcanization process. The "activity" of fillers, *i. e.*, their so-called reinforcing effect, was detd. indirectly by measuring 3 heat effects: (1) the heat of swelling of rubber in C_6H_6; (2) the heat of wetting of the powder by C_6H_6 and (3) the energy represented in the adhesion of filler and rubber. The energy was then calcd. on a basis of 1 g. of C black from the difference between (1) and the sum of (2) and (3). The values of (3) for different fillers is considered to be a criterion of their "activity," particularly since the actual results obtained conform to the relative effects obtained by Wiegand in a quite different way (cf. *C. A.* 14, 2732). Preliminary tests showed that the heat of wetting of C blacks increases with their sp. surface. In studying the thermodynamics of the Joule effect, the change in total energy, the work of extension and the temp. coeff. of the mech. work were detd. The heat tone was directly proportional to the elongation, lending support to the theory that the Joule effect depends upon a fiber structure. From the point of view of the Hock theory (cf. *C. A.* 21, 4092) the Joule heat of elongation is proportional to the no. of aligned and packed particles. The sp. heat of raw rubber, detd. by 3 different methods, averaged 0.37 at 17° and the temp. coeffs. of mech. work involved in stretching to 250, 500 and 800% elongation were —0.002, —0.0024 and —0.0035 cal. per degree C. The heat tone of the reaction between S_2Cl_2 and rubber dissolved in benzine was measured through a range of concn. of 0–1.3 g. of S_2Cl_2 per g. of rubber, but no definite conclusion could be drawn as to whether adsorption or chem. combination was involved. The app., which comprised a specially constructed *calorimeter*, and the technic are described in detail and illustrated. C. C. DAVIS

Rubber in the printing industry. D. R. SCHLITZ. Goodyear Tire & Rubber Co. *Rubber Age* (N. Y.) 23, 619–20(1928).—An illustrated description. C. C. DAVIS

Evaluation of variable temperature cures. J. R. SHEPPARD AND W. B. WIEGAND. Eagle-Picher Lead Co., Joplin, Mo. and Binney & Smith Co., New York. *Ind. Eng. Chem.* 20, 953–9(1928).—Utilizing the generally accepted empirical rule that the intensity of the curing action becomes twice as great for each 15° F. rise of temp., formulas are derived to show the relations between the several variables of a cure segment with a const. temp. gradient, *viz.*, the intensity of curing action, the curing effect, the time and the temp., on the one hand and the consts. of such a cure, *viz.*, the initial temp and the temp. gradient, on the other hand. An exact valuation of cures is applied to schedules with variable temps. by the use of the equations showing the curing effect as a function of the other characteristics of the cure. These equations are the most important ones in practice. The curing effect, which measures the net value of a schedule in effecting vulcanization, can be detd. for a given schedule by calcn. from one of the "effect" equations, by reading directly from graphs which are given, or by estg. the area under an intensity-time curve. The intensity of curing action is a measure of the importance of a temp. in inducing vulcanization, and the intensity-time curve shows the curing ability of the various parts of a schedule even more accurately than the more usual temp.-time curve. Examples of the application of the method to typical factory cures are given. C. C. DAVIS

Chromolited rubber molds. F. E. RICHARDSON. Nat. Chromium Corp. *Rubber Age* (N. Y.) 23, 607–8(1928).—When molds are properly plated with Cr, there is less sticking of the rubber than to other metals because of the unusual resistance to heat and to attack by acids and gases. C. C. DAVIS

The use of mineral oil with a favorable customs duty in the rubber industry. PAUL ALEXANDER. *Gummi-Ztg.* 42, 2410–1(1928).—A discussion dealing with the definition of *solvent for rubber*. C. C. DAVIS

Rubber compression testing machine. C. L. HIPPENSTEEL. Bell Telephone Labs. *India Rubber World* 78, 55–6(1928).—See *C. A.* 22, 2855. C. C. DAVIS

Abrasion tests of rubber stocks containing various types of carbon black. W. B. PLUMMER AND D. J. BEAVER. *Ind. Eng. Chem.* 20, 895–9(1928).—On a slightly modified Williams abrasion machine (cf. *C. A.* 21, 2573) the resistance to abrasion of rubber mixts. contg. different types of C black decreased with increase of the particle size of the abrasive up to 0.45 mm., above which the resistance to abrasion increased. No explanation is offered. Rubber mixts. were then alternately abraided and aged in air at 70° so that only the surface which had deteriorated was worn away. In this way an indication was obtained of the resistance to abrasion of the mixts. under conditions more nearly approaching service conditions, where abrasion and aging progress simultaneously. Some types of C black increased the rate of deterioration much more than did other types, as a result of which the relative resistances to abrasion of mixts. contg. different C blacks changed as aging progressed, in fact the resistance to abrasion of the surface layers of one mixt. may be greater than that of another mixt. before aging but may become less than that of the other after aging. This shows that the value

of a C black must be judged not only by the resistance to abrasion but also by the aging properties which it imparts to rubber. Where the wear is slight compared with the deterioration, the aging imparted by a C black is a determinant factor in the life of a tire. C. C. Davis

Carbon black. I. A study of its volatile constituents. C. R. Johnson. G. L. Cabot, Inc., Boston. *Ind. Eng. Chem.* **20**, 904–8(1928).—Complete analyses were made of 5 types of C blacks, before and after evacuation, and of the gases removed, and a C balance was detd. with the object of correlating the proportion and compn. of the volatile components and the properties imparted to vulcanized rubber mixts. by the blacks. The results show that within certain limits the volatile matter in a C black has no determinant effect on the properties imparted to rubber, but that above certain limits it reduces the reënforcing power of the C black and retards the rate of vulcanization. This undesirable limit is fairly const. for each grade of C black, but the limits vary among different blacks. The gases extd. from the C blacks contained CO, CO_2, H, N, CH_4, C_2H_6, illuminants and O. It is probable that the CO and CO_2 were reaction products of the O originally present. C. C. Davis

Legal specifications concerning the color of rubber goods. A. Beythien. *Gummi-Ztg.* **42**, 2464–5(1928).—Of special concern to German industry. C. C. Davis

The influence of Vulkan colors on the aging of rubber articles. Rudolf Ditmar. Kautschuklaboratorium, Graz. *Gummi-Ztg.* **42**, 2519(1928).—A large no. of "Vulkan" colors were tested in the 2 different base mixts. to det. the influence of the individual colors on the aging of the mixt. Some of the colors caused abnormally rapid deterioration, whereas others had a distinctly preservative effect. Whether the color had a good or a bad effect depended in turn upon the type of rubber mix. C. C. Davis

A scheme of accelerator classification. R. P. Dinsmore and W. W. Vogt. *Trans. Inst. Rubber Industry* **4**, 85–106(1928).—A survey and crit. discussion of the *characteristics of org. accelerators*, which for convenience may be divided into several groups: (1) dithiocarbamates; (2) xanthates; (3) thiuram mono- and disulfides; (4) mercaptobenzothiazoles; (5) aldehyde-amines; (6) ethylideneanilines; (7) guanidines; (8) thioureas, and (9) individual cases, such as *p*-nitrosodimethylaniline, aldehyde-ammonia, hexamethylenetetramine and the CS_2 reaction product of butyraldehydeaniline, of which other accelerators of the same types are not known. Summarized data show the general characteristics of these groups, including their *relative activity and characteristics during manufacturing processes*, their *S requirements*, the *phys. properties which they impart to vulcanizates*, their *stability during vulcanization*, their *antioxidant properties* and their *stearic acid requirements*. The chem. compns. of 46 com. accelerators are also tabulated. In manufacturing, accelerators should be judged by (1) their activity; (2) their ability to disperse and to soften rubber mixts. and not cause scorching; (3) their stability in uncured mixts.; (4) the S requirements; (5) the necessity for stearic acid; (6) their adaptability to air, steam and press curing; (7) their stability during vulcanization; (8) the stiffness and tensile properties imparted to rubber mixts. with and without pigments; (9) their antioxidant power and (10) the changes such as stiffening in vulcanizates contg. the accelerators. These criteria are discussed individually, in some cases with the inclusion of new data. A study of the *difference between tearing by hand and max. tensile product as a criterion of proper cures* showed that with mixts. contg. no pigments and particularly when unaccelerated, there is a big difference between the optimum cures, tearing by hand indicating a shorter cure than max. tensile product. With loaded mixts. these differences become relatively small. The max. resistance to tearing by hand is claimed to coincide in all cases with the cure which ages best. The *rate of oxidation of a rubber mixt. during natural or artificial aging* increases progressively with the time of vulcanization and bears no relation to the flatness of the tensile strength-time of vulcanization curve, so that constancy of tensile strength over a range of time of vulcanization is useless in judging the aging properties imparted by an accelerator to a rubber mixt. The *tendency of a rubber-mixt. to scorch* may be judged by heating for definite periods at 70° or 100° and detg. the plasticity and recovery in a Williams plastimeter before and after such heating. *Stiffening during aging* is not necessarily accompanied by an increase in combined S, and may be simulated artificially by heating rubber mixts. at 70° in an inert gas. Numerous examples are cited to show the behavior of some of the more important individual accelerators. A general discussion follows the paper. Also in *Rubber Age* (N. Y.) **23**, 554–7(1928). C. C. Davis

Watch case vulcanizers. Joseph Rossman. *India Rubber World* **78**, 69–71 (1928).—A chronological review of the patent literature. C. C. Davis

The negative catalysis of autoxidation. Antioxygenic activity (Moureu, Dufraisse) 2. Lead compounds and magnesia (Norris) 18.

STEVENS, H. P.: **Latex.** London: Rubber Growers' Assoc., Inc. 66 pp.

Rubber. WILLIS A. BOUGHTON. Can. 283,464, Sept. 25, 1928. A soln. of ammonium polysulfide is made to react with latex, the liquid is evapd. and the residue heated and vulcanized.

Rubber composition. CHARLES H. CAMPBELL (to American Glue Co.). U. S. 1,683,862, Sept. 11. Sol. and diffusible cleavage products obtained by the hydrolytic decompn. of collagen (short of amino acids) are mixed with rubber. U. S. 1,683,863 specifies the use of products similarly obtained from keratin and U. S. 1,683,864 relates to similar compns. also contg. glue.

Synthetic rubber. I. G. FARBENIND. A.-G. Brit. 283,840, Jan. 14, 1927. Hydrocarbons suitable for manuf. of synthetic rubber such as butadiene, isoprene and dimethylbutadiene are emulsified (*e. g.*, with water and soap and egg albumin or with Na isobutylnaphthalenesulfonate) and then polymerized in the presence of O or substances such as a perborate or percarbonate which yield O.

Synthetic rubber. I. G. FARBENIND. A.-G. Brit. 283,841, Jan. 15, 1927. Polymerization of hydrocarbons such as butadiene, isoprene or dimethylbutadiene is effected by treatment with an alkali metal such as Na or K, in an atm. of H, N or CO_2 and in the presence of an org. hydroxy compd. or ether of high mol. wt. such as glycerol, starch, cellulose, a cellulose ether or superficially oxidized rubber. Temps. of 40–60° are suitable for effecting the polymerization in various examples which are given.

Rubber from sprayed latex. DUNLOP RUBBER CO., LTD., AND D. F. TWISS. Brit. 283,984, Sept. 17, 1926. Latex or a similar aq. rubber dispersion (which may be mixed with various modifying agents) is sprayed in a damp unheated state upon the unheated surface of a mold or former.

Solvent and dispersing agents for rubber. EBERHARD MEYER. Ger. 463,290, July 5, 1928. Esters of tetrahydronaphthol, *e. g.*, tetrahydronaphthol acetate or naphthenate, are used as non-volatile solvents or dispersing agents for rubber.

Making laminated rubber tire tubes from sheet material. ALBERT E. HENDERSON. U. S. 1,683,669, Sept. 11. Mech. features.

Coating metals with rubber. F. AHRENS. Brit. 283,049, April 16, 1927. Rubber coatings are attached to metals by use of a rubber soln. contg. S chloride or other suitable acid substance which attacks the metal and facilitates the formation of metal sulfide which assists in bonding of the metal and rubber. Oils such as a mixt. of rape and linseed oils also may be added to the rubber soln. Cf. *C. A.* **22**, 3806.

Porous rubber. H. ZIEGNER. Brit. 283,566, Jan. 14, 1927. A porous material such as wood sawdust is first satd. with a swelling medium such as benzine and then mixed with rubber compns. which may also contain fillers and vulcanizing reagents. The benzine or the like first causes the rubber to swell where it contacts with the added porous material and then during the drying operation to contract and become loosened from the sawdust or other added particles. The porosity may be further increased by adding water, which evaporates during vulcanization and enlarges the pores.

Rubber articles. ANODE RUBBER CO., LTD. Brit. 283,871, Jan. 18, 1927. The properties of articles made directly from rubber latex (suitably by electrophoresis or dipping) are modified by adding to the latex an artificially prepd. dispersion of coagulated rubber, gutta, balata or similar material. Various coloring, vulcanizing and modifying agents may also be added.

Rubber articles. DOUGLAS F. TWISS (to The Dunlop Rubber Co., Ltd.). Can. 283,262, Sept. 11, 1928. Articles of rubber are manufd. by treating the surface of a mold with a layer of jelly including a coagulant of the character of Na_2SiF_6, and dipping the mold into the material of which the article is to be formed.

Rubber heels. RICHARD F. KINSLEY (to Dryden Rubber Co.). U. S. 1,684,100, Sept. 11. In forming heels from ground waste vulcanized rubber, partially cured blanks of smaller area but greater thickness than the finished article are inserted in a mold, a layer of rubber material of greater plasticity and lesser elasticity than that of the blank is placed on the latter and the assembly is subjected to heat and pressure.

Vulcanization accelerator. W. J. KELLY. Brit. 283,679, Nov. 9, 1926. 1-Mercaptobenzothiazole, used as an accelerator, is made by heating to about 280° in an autoclave, $PhNH_2$, S and CS_2. The product is dissolved with NaOH and pptd. with HCl.

Vulcanization accelerator. L. B. SEBRELL. Brit. 283,661, Oct. 26, 1926. 1-Mercaptobenzothiazole, used as an accelerator, is made by heating under pressure a mixt. of NH_3 (as gas or aq. soln.), CS_2, $PhNH_2$ and S.

CHEMICAL ABSTRACTS

Vol. 22. NOVEMBER 20, 1928 No. 22

1—APPARATUS AND PLANT EQUIPMENT

W. L. BADGER

Instruments and apparatus. C. F. HIRSHFELD *et al.* *Mech. Eng.* **50,** 792–7 (1928).—A description of various types of gage *thermometers,* both indicating and recording, together with recommendations for their installation. T. S. CARSWELL

Laboratory mixing wheel or agitator. CLARK B. CARPENTER AND W. A. MANUEL. Colorado School of Mines. *Ind. Eng. Chem.* **20,** 1072(1928). E. H.

Specific gravity indicators. C. F. SPAULDING. *Eng. Mining J.* **126,** 499–500 (1928).—S. describes two float-type indicators, easily made in the mill, esp. for detg. pulp density. One is for use in tanks, the other in shallow launders. A. BUTTS

The pocket polarimeter of Leitz. K. SEILER. *Schweiz. Apoth. Ztg.* **66,** 181–2(1928); cf. *C. A.* **22,** 2203.—Report on an improved model (No. 253). The errors in detg. concns. of dextrose solns. (0.3–9.95%) vary within the narrow limits of +0.14 and −0.10%. S. WALDBOTT

Conductivity apparatus. JESSE E. DAY AND FORD C. DAVIS. Ohio State Univ. *J. Chem. Education* **5,** 1121–2(1928).—A simple, convenient and rather inexpensive cond. app. for first course chem. students is described. L. D. R.

Self-adjusting buret apparatus. ROBERT C. HOCKETT. Ohio State Univ. *J. Chem. Education* **5,** 1131–2(1928).—A very simple automatic buret is described. Opening the stopcock in the side arm of the buret automatically fills the buret to the zero mark. The glass work is extremely simple. L. D. R.

A new buret for volumetric analysis. N. M. KETOV. *Ann. inst. polytech. Oural* **6,** 355–7(1927).—For titrations with solns. easily decompd. while in contact with rubber or with stopcock grease, K. suggests a novel buret which ends at the bottom by an open narrow capillary and is closed at the top by a ground glass stopper provided with a capillary tubing and a stopcock. The flow of liquid can be regulated by opening or closing the stopcock. It is more convenient, however, to have the upper capillary connected with a tightly stoppered flask, through the stopper of which a second tubing is led and connected with an ordinary buret filled with water. The flow of liquid from the first buret is now regulated by admitting desired amts. of water from the second buret into the flask. G. B. KISTIAKOWSKY

A colorimeter without standard fluid (new model). A. ADLER. Univ. Leipzig. *Z. ges. exptl. Med.* **55,** 672–93(1927); cf. *Klin. Wochschr.* **1922,** 1492.—The colorimeter consists of an illuminating sphere contg. a 20 watt lamp, a holder for the soln. being studied, and a d. scale in the form of a disk. Projecting into the sphere is an eyepiece tube with an opening for placing various filters in the path. From a color chart and set of absorption curves the correct filter is selected for the soln. in question, and the transmission detd. by the use of the d. scale. F. L. DUNN

A simple colorimeter for determining iron and other components in water. F. MEINCK AND MARGARETE HORN. Landesanst. f. Wasser-, Boden- u. Lufthyg., Berlin-Dahlem. *Kl. Mitt. Ver. Wasserversorg. Abwasserbeseitig.* **2,** 130–5(1926); *Chem. Zentr.* **1927,** II, 1745.—With the new colorimeter 0.1 mg. of Fe, 0.1 mg. of NH_3 and 0.5 mg. of N_2O_3 per l. in 100 cc. of water can be detd. C. C. DAVIS

A modification of the Soxhlet extraction apparatus. N. SPASSKII. *Oel-Fett-Ind.* (Russia) **1927,** No. 3–4, 31–3; *Chem. Zentr.* **1927,** II, 1905.—The advantage of the new extn. app. constructed by S., which is illustrated, lies in the fact that the extn. can be carried out without heating. Furthermore it is cheaper and more durable than the regular Soxhlet app. It yields pure oil, so that filtration of the ext. is unnecessary. Losses of Et_2O are a min. C. C. DAVIS

Modified apparatus for determination of sulfur in iron and steel. M. H. STEINMETZ. *Ind. Eng. Chem.* **20,** 983(1928).—The app. consists of a special condenser attached to a Johnson S flask. The condenser is a Liebig condenser constructed so

that acid may be fed through a tube passing down the inner annular space, while the evolved H_2S passes between the condenser walls and the tube delivering the acid.

T. S. CARSWELL

Pyrometers for surface temperature measurements. ANON. *Indian Textile J.* **38,** 378–9(1928).—The Cambridge Instrument Co., London, has devised a new form of pyrometer which can be applied directly to the surface of such machines as calendering rolls, drying cylinders, vulcanizing presses, etc. The thermocouple consists of pieces of Cu and constantan (or other suitable metals) welded end to end and rolled out to form a continuous flexible strip with a smooth surface on both sides. The strip is supported, under spring tension, in a frame which forms a convenient handle. The hot junction is in the middle of the metal strip, so that when applied to the heated roller, a portion of the strip on either side is in direct contact with the surface to be measured. Several modifications of the strip thermocouple are described and illustrated. In one form, the thermocouple is attached directly to a millivoltmeter, calibrated in degrees, which is mounted on the back of the bow spring handle.

RUBY K. WORNER

A simple ultra-violet fluorophotometer. B. T. SQUIRES AND J. H. JEFFREE. *J. Sci. Instruments* **5,** 273–7(1928). E. J. C.

A microphotometer for the study of spectrograms. I. J. GWINN. State Univ. of Ia. *Proc. Iowa Acad. Sci.* **34,** 279(1927).—A modification of Harrison's microphotometer has been developed, following his suggestion, which is used for accurate measurements of line widths on spectrograms. A vertical optical system using microscope lenses focuses the light on a Bi-Ag thermocouple. Accurate readings of length are obtained with a finely constructed micrometer screw. Studies have also been made on the relative intensities of lines on both optical and x-ray spectrograms. The instrument is also of use in testing the uniformity of thin films of metal. W. G. GAESSLER

A new photogoniometer. ERICH HERLINGER. *Fortschritte Mineral. Kryst. Petrog.* **12,** 41–2(1927).—A brief description is given of a new photogoniometer for use in the study of crystals used in crystal structure detn. J. F. SCHAIRER

Universal x-ray photogoniometer. J. D. BERNAL. *J. Sci. Instruments* **5,** 241–50 (1928); cf. *C. A.* **21,** 3551.—B. describes and presents 8 illustrations of a photogoniometer made by W. G. Pye & Co., Cambridge, Eng. Its main features are: a clockwork motor which may drive the goniometer spindle directly through bevel wheels at a uniform velocity in one direction, or indirectly through a cam and lever arrangement which permits oscillations of the spindle; the fixed slide of the aperture carriage, which is mounted directly on the base; the aperture holder which can take either a slit system of vertical and horizontal adjustable slits, or an adjustable pin-hole system, or an ordinary optical collimator which is adjustable with regard to distance from the spindle axis; a swinging arm which supports the plate carriage slide; the plate carriage which can take several size plates or a telemicroscope and which also supports the cylindrical camera; the fixed circle which enables the positions of the crystal and plate to be detd.; and the gomiometer head which is of the usual type. The instrument may be used as an optical goniometer, or as an x-ray camera for taking Laue, spectroscopic, rotation and oscillation and Debye-Scherrer pictures. R. L. HERSHEY

A simple high-speed rotary pump. L. E. BAYLISS AND E. A. MÜLLER. Univ. College, Lond. *J. Sci. Instruments* **5,** 278–9(1928).—A small rotary pump is described, suitable for liquids or gases in which the fluid is forced through a rubber tube by the pressure of a series of rollers passing along it. Glycerol is used as a lubricant and the whole pump can be mounted in a glycerol bath. The output of such a pump in cc. per min. is a linear function of the speed up to about 1100 r.p.m. which corresponds to about 170 cc. per min. A pump with a rubber tube 7 mm. internal diam. gives about 12 l. per min. The rubber tubes must frequently be replaced after 24–36 hrs continuous operation. J. H. PERRY

A magnetically operated circulating pump for gases. FRANK ADCOCK. Nat. Phys. Lab. *J. Sci. Instruments* **5,** 290–2(1928).—A description of a simple form of gas circulating pump designed to avoid contaminating the gas with oil or air. Motion is imparted to an iron piston by supplying an interrupted current to a solenoid which surrounds the upper part of the pump barrel. H_2 has been circulated at rates up to 30 cu. ft. per hr. J. H. PERRY

Efficient stirrer for gas absorption. A. F. BENNING. Univ. of Notre Dame. *Proc. Indiana Acad. Sci.* **37,** 263–4(1927).—The object of the stirrer is to promote intimate contact between a gas and a liquid. Two short pieces of glass tube are sealed horizontally to the stirrer shaft, also of tube, so as to leave a short projection below the arms, *i. e.*, to form a 4-way piece The upper end of the tubular shaft is closed but

there is a small hole blown in any convenient spot of the lower part. The junction of the 4 tubes is constricted. On rotating the stirrer with the arms below the liquid the friction loss at the liquid entrance and the contraction reduces the pressure within the shaft and gas is drawn down to mix with the liquid. When the arms are just free of the liquid surface gas will be drawn down the hole and mixed with the liquid drawn up the shaft. A high revolving speed is necessary; hence couplings to the motive power should be flexible, pressure tubing and rubber stoppers being used.
S. L. B. ETHERTON

Gas generator. E. J. KRAUS. *Chem.-Ztg.* **52**, 711(1928).—The novel feature of this app. operating without valves is a glass rod which carries on its flattened end the perforated material (FeS, Zn, etc.). For interrupting the gas generation, the glass rod which is held in a rubber stopper, is pulled up, until the material is lifted above the surface of the acid. G. SCHWOCH

New apparatus for determining gas densities by Bunsen's flow principle. H. KAHLE. *Z. angew. Chem.* **41**, 876–80(1928).—Directions are given for operating 2 types of modified Bunsen app. in which the gas is passed back and forth through an orifice between 2 arms of the app. Results are given with air, N, O, H, CH_4, CO_2, He, Ne and A, with references. J. H. MOORE

Apparatus for sampling gases of sealed tins. C. H. F. FULLER. *J. Sci. Instruments* **5**, 259(1928).—A 7-mm. glass tube is tapered down to 2.5 mm. and fitted with a 2.5 mm. side tube. A steel needle tapered to fit the inside of the glass tube is placed inside the glass tube to which it is joined by a rubber cap, which seals off the space between the needle and tube. The base of the tube is fitted with a rubber suction cap which makes it possible tightly to attach the whole device to the can to be tested. The can is punctured by the needle and the gases are withdrawn through the side tube.
R. L. HERSHEY

A simple device for the measurement of light absorption. K. ŠANDERA. *Chem. obzor* **3**, 69–73(1928).—See *C. A.* **21**, 3492. JAROSLAV KUČERA

A simple extraction apparatus. I. YA. POSTOVSKII AND E. M. TITOV. *Ann. inst. polytechn. Oural* **6**, 359–60(1927).—An app. for extn. by means of heavy liquids, which can be easily constructed in a lab., is described. G. B. KISTIAKOWSKY

Use of the interferometer in scientific and technical work. E. BERL AND L. RANIS. Inst. Techn. Hochschule Darmstadt. *Fortschritte Chem., Physik physik. Chem.* **19**, 1–52(1928).—A comprehensive description of gas and liquid interferometers and their uses in phys. and chem. measurements. J. S. PERRY

The independent constructor in the chemical industry. HANS WOLLENBERG. *Chem. App.* **15**, 195(1928). J. H. MOORE

Determining the most favorable wall thickness of industrial furnaces. H. REPKY. *Arch. Wärmewirt.* **9**, 145–9(1928).—A mathematical discussion, especially of the case of intermittent use. ERNEST W. THIELE

The electric micro-combustion furnace of Heraeus. BONIFAZ FLASCHENTRÄGER. Univ. Leipzig. *Z. angew. Chem.* **41**, 840–1(1928).—Description, with directions for operating (cf. *C. A.* **20**, 2802). J. H. MOORE

Metal air heater for industrial furnaces. WALDEMAR DYRSSEN. *Iron Steel Eng.* **5**, 81–4(1928).—The materials which have been used in the construction of air preheaters for furnaces are discussed. Heat-resisting steels, such as high-Cr steels, seem to be most suited to this type of service. A few representative air heaters which are constructed of heat-resisting steel are described, and diagrams are given showing their construction. M. C. ROGERS

Heat and power plants. CHR. EBERLE. *Arch. Wärmewirt.* **9**, 41–5(1928).—Installations are described in which steam is generated at high pressure, and after furnishing power, is used as process or heating steam in textile plants and the like.
ERNEST W. THIELE

Long-distance heating and copper installation. ANON. *Apparatebau* **40**, 219–21 (1928).—The advantages of Cu over Fe are stressed. J. H. MOORE

Automatic regulation, especially for electric oven. ANON. *Chem.-Ztg.* **52**, 721 (1928).—The temp. is regulated by an adjustable contact thermometer which will work for temps. as low as 50–100°. J. H. MOORE

The mechanical chemist—another miracle of modern science. (Methane continuous recorder.) JOHN H. SCHALEK. *Natural Gas* **9**, No. 9, 26–7(1928).—An app. is described which will continuously analyze and permanently record the percentage of methane in air. The operation of the recorder may be described as follows: a small motor-driven pump draws the gas sample into the instrument. The sample first passes through a chem. absorber for removing water vapor and CO_2. The sample next passes

through an automatic flow regulator, where the correct predetd. const. vol. of sample is fed into the machine. It is then conducted through a silica or porcelain tube heated to about 800° by an elec. furnace. Here the methane is completely oxidized to CO_2 and water. These products are removed by a chem. absorber; as a result there is a contraction in the vol. of the sample equiv. to 3 times the vol. of the methane originally present. The remainder of the sample is led through a second flow meter equipped with a sensitive differential recorder. If no methane is present the vol. will remain const., and the head of pressure required to force it through the second orifice will be identical with that of the first orifice. If methane is present the pressure required to force the reduced vol. of the sample through the second orifice is correspondingly lower. This difference in pressure is recorded on a chart calibrated to read percentages of methane direct. The pen arm has a travel of nearly 4 in. for approx. 2% methane The machine is sensitive to less than 0.02% methane. This same principle can be applied to give a continuous record of such gases as O, CO and CO_2. E. G. M.

"Acid-alkalimeter"; a direct-reading p_H meter. KENNETH H. GOODE. *J. Optical Soc. Am.* **17**, 59–71(1928).—G. has used in a H-ion meter 3 tubes, with a milliammeter as indicating device. He has also described a two-tube instrument. Thoriated filament tubes have been abandoned for the oxide-coated type. In the second instrument the indicating device is a special Weston 3-terminal voltmeter-milliammeter. Diagrams of the circuits of the original, the 3-tube and the 2-tube simplified acid-alkalimeter are given. L. D. R.

Steel barrels and drums. R. M. HUDSON. Bur. of Standards. *Simplified Practice Recommendation* **R20-28,** 9 pp.(1928). E. J. C.

Electrodes for p_H determinations (FASOL) **7.** Pb as a constructional material for chemical plant (TUNGAY) **9.** Heat transfer data for the scrubber designer (ROSEBAUGH) **13.** Heat capacities of organic compounds at low temperatures. I. Precision calorimeter and thermostat for low temperatures (ANDREWS) **2.** Apparatus for gravity separation of ores or other materials (U. S. pat. 1,685,521) **13.**

Laboratory table. OLIVER G. HARNE. U. S. 1,686,234, Oct. 2. Structural features.

Apparatus for transferring measured small quantities of liquids for laboratory purposes. LEON H. CORNWALL and GEORGE P. SCHMITT. U. S. 1,687,007, Oct. 9.

Air washing apparatus. ALVIN H. COLBERT. U. S. 1,686,144, Oct. 2.

Water still. ERNON V. OLIVER. U. S. 1,686,418, Oct. 2.

Viscometer. JACQUES WOUDHUYSEN and GASTON ORY. U. S. 1,685,896, Oct. 2

Dewar flask. GISELA GRUNWALD. Austrian 108,989, Oct. 15, 1927. An adsorbent for air is arranged in the space between the walls.

"Bubble tower" for fractionations or use in other processes. LOUIS E. WINKLER and FRED C. KOCH. U. S. 1,686,542, Oct. 9. Structural features.

Regulating the temperature of catalytic converters, etc. C. E. ANDREWS (to Selden Co.). Brit. 285,499, Feb. 19, 1927. A two-phase liquid-vapor system such as an alloy of Cd and Hg is used with a reflux condenser and the b. p. of the system is varied by altering the compn. or the quantity of reflux condensate before returning it to the liquid phase in the system. An app. is described.

Filter. ETABLISSEMENTS SIMONETON (SOC. ANON. À RESPONSABILITÉ LIMITÉE). Fr. 633,782, May 3, 1927. Constructional details.

Filter and faucet construction. S. BARRAND. Brit. 285,334, Sept. 12, 1927.

Rotary drum apparatus for straining liquids. F. W. BRACKETT. Brit. 284,403, Oct. 28, 1926.

Rotary drum and travelling cloth belt filter and washing apparatus for treating liquids. D. STEWART & CO., LTD. (W. Mauss). Brit. 284,960, Sept. 24, 1927. Structural features.

Bag filter. FIRMA FRITZ SCHEIBLER. Fr. 635,462, June 2, 1927. The flow tubes of closed bag filters are connected to the taps by bayonet joints.

Filter press. LOUIS A. J. REVEL. Fr. 635,962, June 14, 1927.

Thermometer suitable for use on engines or other vibrating apparatus. EDWARD B. FOOTE (to Taylor Instrument Companies). U. S. 1,685,193, Sept. 25. Structural features.

Temperature alarm. ÖSTERREICHISCHE SIEMENS-SCHUCKERT-WERKE. Austrian 109,103, Nov. 15, 1927. Constructional details.

Temperature alarm sensitive to undue rise or unduly rapid rise of temperature. J. PICARD and A. TOURNADRE. Brit. 284,650, Feb. 2, 1927. Structural features.

Apparatus for the production of very high temperatures and pressures. GEORGES BOIVIN. Fr. 32,709, July 7, 1926. Addn. to 615,329. The protecting substance of the refractory material is in the form of an impalpable powder such as sandstone, alum or graphite compressed alone or with appropriate substances.

Heat-exchange apparatus formed with drilled or grooved metal blocks or plates. C. W. STANCLIFFE. Brit. 285,151, Nov. 11, 1926.

Acetylene generator. AUGUST VALENTOUR. U. S. 1,684,979, Sept. 18.

Acetylene generator. AUGUSTE F. GIRARDIN. Fr. 32,626, Nov. 12, 1925. Addn. to 554,247. Constructional details.

Acetylene generator. GAUDÉRIQUE A. D. MONA. Fr. 635,258, May 31, 1927. Means is provided for the automatic addition of CaC_2 as the amt. of gas decreases.

Acetylene generator. RICHARD MUTSCHELE. Fr. 635,268, July 3, 1926.

Combined carbide can and water receptacle suitable for refilling miners lamps. ANDREW KOZAK. U. S. 1,684,996, Sept. 18.

Ultra-violet ray lamp construction. J. ROBINSON. Brit. 284,746, Oct. 28, 1926. Screens are provided to obtain a spectrum from the lamp similar to that of solar light as received at the surface of the earth.

X-ray tube. MONTFORD MORRISON. U. S. 1,685,928, Oct. 2. Structural features.

Electron tubes (x-ray tubes, etc.). EUGÈNE ROUGE. Fr. 635,925, June 13, 1927. A layer contg., in part at least, a dioxide of an alk. earth metal, *e. g.*, BaO_2 is formed on the cathodes of electron tubes. Cf. *C. A.* **22**, 1708.

Base for electron tubes. THOMAS SCHWARZOTT. Austrian 108,865, Oct. 15, 1927. Constructional details.

Röntgen tube. SIEMENS-REINIGER-VEIFA (Ges. für medizinische Technik m. b. H.). Fr. 635,694, June 9, 1927.

Arrangement for adjusting Röntgen tubes. SIEMENS REINIGER-VEIFA (Ges. für medizinische Technik m. b. H.). Fr. 635,758, June 10, 1927.

Evacuating Röntgen-ray tubes and other high vacuum devices. H. C. RENTSCHLER (to Westinghouse Lamp Co.). Brit. 284,623, Feb. 1, 1927. A "getter" of Al is used which absorbs H and other gases and may be originally secured to the anode by welding or by inserting under a struck-out strap. Various other features are described.

Vacuum tubes. E. Y. ROBINSON and METROPOLITAN-VICKERS ELECTRICAL CO., LTD. Brit. 285,536, Nov. 9, 1926. Various structural features are specified. Multiple filaments mounted on a frame may be coated (as described in Brit. 285,538) with oxide or with a metal or compd. subsequently converted into oxide or may be otherwise treated to reduce the work function, *e. g.*, thoriated W filaments may be treated with a reducing agent such as C. Brit. 285,537 also specifies structural features. Zigzag filaments or the like may be mounted on hooks suitably formed of Mo or W and which may be repeatedly dipped in an aq. suspension of porcelain and kaolin and dried and finally treated with a blowpipe flame to effect fusion of the coating. Brit. 285,538 specifies fine filaments which may be provided with a sheath of different metal (which may be applied by the Wollaston process) which may be subsequently removed, *e. g.*, a Ag sheath on a Pt-Ir filament may be dissolved with dil. HNO_3 or removed by heating *in vacuo*, and after removal of this coating an oxide coating may be applied which may be converted into carbonate or carbonate coatings may be formed from nitrates such as those of Ba or Sr by reaction with CO_2.

Electric vacuum tubes. NAAMLOOZE VENNOOTSCHAP PHILIPS' GLOEILAMPENFABRIEKEN. Brit. 285,434, Feb. 16, 1927. Cathodes to be operated at incandescence are formed with a core such as W wound with Ni wire coated with alk. earth oxides and heated in O or other oxidizing atm. (suitably at 1000° with a coating of BaO). Cf. *C. A.* **22**, 1501.

Electrical contacts for vacuum tubes. STERLING G. SEARS (to Naylor Radio Corp.). U. S. 1,684,973, Sept. 18. Vacuum tubes with pins of oxidizing metal are provided with caps of spring metal having contact surfaces of Au or other non-oxidizing metal.

Furnace. STEPHEN MOGYORÓS and STEPHEN VISI. Fr. 634,703. May 19, 1927. A furnace has 2 combustion chambers and a smoke conduit, one extremity of which can be put in communication with one or other of 2 ash-pits of the app., while the other extremity can communicate with one or other of the combustion chambers, so that the smoke, etc., from one of the chambers, freshly stoked, is directed to the ash-pit and so to the hearth of the other chamber.

Furnaces. CHAUFFAGE ET RÉCUPÉRATION THERMIQUE. Fr. 635,155, Sept. 29, 1926. High temps. are reached in furnaces by feeding the burners with previously mixed gas and air, the air at least being heated before mixt.

Furnace using powdered coal. CARL BRACKELSBERG. Fr. 635,385, June 1, 1927. The powdered coal is introduced directly into the furnace, *e. g.*, a rotating furnace, without the usual antichamber.

Combustion chamber of coal dust furnace. KARL HUFSCHMIDT. Fr. 636,039, June 16, 1927. The space between the arched walls of the chamber and the exterior envelope is filled with granular material, which serves as a flexible support.

Shaft furnace or gas producer construction. STETTINER CHAMOTTEFABRIK A.-G. VORM DIDIER and E. TERRIS. Brit. 284,639, Feb. 2, 1927.

Gas burner suitable for furnaces. HAROLD D. SCHRADER. U. S. 1,686,711, Oct. 9.

Burner construction for regenerative furnaces. MICHAEL J. LACKNER. U. S. 1,685,543, Sept. 25.

Furnace "efficiency." JACOB M. SPITZGLASS (to Republic Flow Meters Co.). U. S. 1,686,186, Oct. 2. A temp. indicator moves away from a CO_2 indicator as the temp. of stack gases increases and toward it as the temp. decreases and the CO_2 indicator moves toward the temp. indicator as the % of CO_2 in the stack gases increases and moves away as it decreases.

Thermocouple and associated electric system for controlling the temperature of furnaces, etc. HARLAN S. GANO (to Westinghouse Elec. & Mfg. Co.). U. S. 1,685,995, Oct. 2.

Apparatus for the combustion of heavy liquid fuels. ANDRÉ MINNE. Fr. 32,662, May 20, 1926. Addn. to 623,437.

Apparatus for low-temperature distillation of coal, wood, oil shale, etc. HENRY G. LYKKEN. U. S. 1,685,496, Sept. 25. The material under treatment is heated in an annular pan having inlet and outlet ports and scrapers for moving the material along the pan from the inlet toward the outlet port.

Heat-exchange device. C. H. POTTS. Brit. 285,524, Oct. 8, 1926.

Heat-exchange apparatus with tubes for holding one fluid while another passes around the tubes. SOC. ANON. DES ETABLISSEMENTS DELAUNAY-BELLEVILLE. Brit. 284,338, Jan. 29, 1927.

Tunnel kiln construction. WOODALL DUCKHAM (1920), LTD., AND A. M. DUCKHAM. Brit. 285,323, Aug. 12, 1927.

Rotary kiln construction. VICKERS, LTD., AND L. D. PARKER. Brit. 284,494, March 23, 1927.

Rotary kiln for treating wet slurry, etc. J. S. FASTING. Brit. 284,276, Jan. 27, 1927. Structural features.

Kilns. JOHANN LAURENZ FURIAKOVICS and KARL HUHN. Austrian 108,079, Oct. 15, 1927. Constructional improvements are described in the stirring devices of pyrites burners, etc.

Gas burner. WILLIAM L. SHARP (to Ohio Foundry & Mfg. Co.). U. S. 1,684,457, Sept. 18.

Gas burner. PHILIP J. SONNER. U. S. 1,684,647, Sept. 18.

Gas burner with automatic safety valve. HENRIK BACH. U. S. 1,687,358, Oct. 9.

Gas generator with a grate and a rotating ash-removing bar over the grate. C. W. ANDREWS and W. B. CHAPMAN. Brit. 284,805, Nov. 22, 1926. Various structural features are specified.

Apparatus for analysis of gas. MARCEL J. E. CHOPIN. Fr. 32,607, Dec. 7, 1926. Addn. to 597,636. A hydraulic arrangement allows the formation over a relatively long time of a sample of gas and its rapid delivery to the analyzer. The contents of a vessel fed by a detd. flow of water are emptied into the body of a pump and the pump gradually evacuates. The pump is connected on the one hand with the gas to be analyzed and on the other to the analyzer by suitable valves.

Indicator for the automatic analysis of gas. MONO G. M. B. H. Fr. 32,567, Nov. 22, 1926. Addn. to 582,062. Improvements are described in an app. for automatically indicating at a distance the analysis of a gas on a system of absorption.

Electrically operated valve suitable for supplying gas to burners. HENRY L. STEPHENSON. U. S. 1,684,603, Sept. 18.

Apparatus for observing the color, turbidity or rotation of the plane of polarization of liquids or gases. F. HERZFELD-HOFFMANN. Brit. 284,607, Jan. 31, 1927.

Apparatus for washing gas or air. SAMUEL N. CHEW and PNEUMATIC CONVEYANCE AND EXTRACTION, LIMITED. Fr. 635,763, June 10, 1927.

Valve for gas and hot blast. WESTFALISCHE METALLWERKE & CIE. Fr. 635,997,

June 15, 1927. The seating rings form part of the body of the valve and the whole is traversed by a system of canals for the circulation of a refrigerating medium.

Valve and pipe system and diaphragm governor for proportionately mixing air and fuel gas or other fluids. Garnet W. McKee. U. S. 1,684,500, Sept. 18.

Apparatus (with a coir fiber filter) for filtering and moistening air. A. C. Handley. Brit. 285,561, Nov. 17, 1926.

Apparatus for drying solid particles carried by gases and for precipitating salts from solution by cooling. P. Schmidt. Brit. 285,046, Feb. 9, 1928. Gases carrying particles to be dried are conducted between a fixed heated plate and a closely spaced adjacent rotary plate. For crystn., an app. may be used in which the soln. flows upwardly through a duct into the space between a water-cooled rotary chamber and a fixed plate; the crystals collect beneath the fixed plate and the solvent flows away above the rotary chamber (which is of flat plate form).

Device for separating dust from air, etc., by centrifugal action. A. Stievenart. Brit. 284,980, Feb. 4, 1927. A water spray may be used in the device specified.

Device for removing suspended solid particles from air or other gases by centrifugal action. F. S. Talty and J. W. Gover. Brit. 284,221, Jan. 24, 1927.

Baffle device for separating solid particles from smoke and gases. A. Parker. Brit. 284,398, Oct. 27, 1926.

Centrifugal apparatus for separating carbonized particles from distillation gases. Trocknungs-Verschwelungs- und Vergasungs Ges. Brit. 285,387, Feb. 14, 1927.

Apparatus for treating furnace gases to remove dust and carbon dioxide. C. V. A. Eley. Brit. 285,544, Nov. 15, 1926. The gases are filtered and treated with alkalies such as lime or soda.

Apparatus for liquefaction and rectification of air or other gases. W. L. de Baufre (to S. G. Allen). Brit. 285,468, Feb. 18, 1927.

Apparatus for the liquefaction and separation of gaseous mixtures, particularly air, into their constituents. Christian W. P. Heylandt. Fr. 635,855, May 21, 1927. The entering air is divided into two parts; one part passes into an expansion vessel and from this, after passage through a heat exchanger, to a high-pressure column of a sepn. app. The other part, expanded by its passage through a heat exchanger and evaporator, is led through a throttling valve into the high-pressure column.

Apparatus for absorbing gases by liquids. V. N. Golovanov. Russ. 4046, Nov. 15, 1927.

Apparatus and system for maintaining constant heating value per unit volume in gases such as formed by mixing two different gases supplied through a conduit. Ulric O Hutton and Edwin X. Schmidt (to Cutler-Hammer Mfg. Co.). U. S. 1,686,751, Oct. 9.

Metal vessel arranged for heating or cooling by chemical reactions. K. Gyorgy. Brit. 285,511, Feb. 19, 1927. Various structural details are specified of a device which may be heated with lime and water or cooled by NH_4NO_3 and water.

Cylinder and plunger apparatus for emulsifying various liquids. Guy C. Hurrell. U. S. 1,685,424, Sept. 25.

Colloid mill and emulsifying apparatus. J. Bourdais. Brit. 285,258, March 1, 1927.

Centrifugal apparatus for mixing or emulsifying liquids. A. C. E. Anderson-Orris. Brit. 284,910, May 17, 1927.

Apparatus for emulsifying milk powder, water and butter or other materials. G. C. Hurrell. Brit. 285,159, Nov. 13, 1926. A plunger is positioned in a cylinder with a slight clearance space through which the materials under treatment are forced by the action of the plunger.

"Centrifugal liquid crucible." Juvenal Maximoff and Maria S. de Costa. U. S. 1,684,800, Sept. 18. A rotatable and heated app. is described adapted to form Cu, Mn, Cr or other suitable molten metal into crucible shape so that it may serve for holding quartz during melting or for other high-temp. operations.

Apparatus for drying, evaporating, disinfecting and heating under vacuum. F. F. Gartung. Russ. 4183, Dec. 31, 1927.

Apparatus for drying fruits, vegetables or other materials with preheated air. Frederick E. Whorff. U. S. 1,686,500, Oct. 2.

Apparatus for drying paper or other materials in long lengths. A. Lambrette. Brit. 285,378, Feb. 14, 1927.

Drying cylinder for paper, textiles, etc. Bernhard Wicky and Herbert Schmolka. Austrian 109,048, Nov. 15, 1927. Constructional details.

Vertical column apparatus for drying coal, grain or other bulk materials. OLIVER W. RANDOLPH. U. S. 1,685,338, Sept. 25.

Drying tunnel with devices for heating and circulating air. H. WINKLER. Brit. 284,747, Oct. 28, 1926.

Electrical method for determining and controlling the humidity of substances such as paper, cellulose and air. JAMES D'ARGAVILLE CLARK. Fr. 635,296, May 17, 1927.

Extrusion press for expressing liquid from peat or other materials. H. SKÖLDBERG. Brit. 284,318, Jan. 29, 1927. Structural features.

Apparatus for clarifying used "dry cleaning" liquids by filtration, alkali treatment, etc. FRANK E. BOWERS. U. S. 1,687,235, Oct. 9.

Thickening for separating solids in muds formed in sugar production or other hot solid-liquid suspensions. HARRISON S. COE. U. S. 1,686,203, Oct. 2.

Boiling-pans. I. G. FARBENIND. A.-G. Brit. 284,281, Jan. 27, 1927. Pans for heating or cooling by means of ordinary or Perkins tubes have an enamel coating on a cast iron lining or outer coating.

Spray attachment for retorts for heating bottles, etc. ROBERT A. SINDALL (to Mavis Bottling Co. of America). U. S. 1,685,884, Oct. 2. Structural features.

Horizontal pipe system for separation of lighter and heavier portions or ore mixtures, etc., by flowing liquid. A. C. HOUDIJK. Brit. 284,826, Dec. 16, 1926. Upper and lower branch discharge pipes lead off the sepd. constituents.

Apparatus for continuous mixing and delivery of "lard compound" or other semisolid materials. RALSTON B. BROWN. U. S. 1,686,953, Oct. 9.

Safety vapor outlet for containers holding petroleum distillates, or other inflammable materials. RICHARD J. MONNETT (to Monnett Co.). U. S. 1,686,918, Oct. 9. A thermo-expansive device in a vent pipe serves to close a pressure relief valve in the pipe when heated.

Centrifugal, grinding and comminuting apparatus for mixing, emulsifying, homogenizing or comminuting various materials. H. HILDEBRANDT. Brit. 284,354, Jan 28, 1927.

Apparatus for cooling hollow pistons, etc. FRANZ PUENING. U. S. 1,687,142, Oct. 9. A device such as a piston propelling hot gases is supplied simultaneously on its interior and exterior surfaces with a relatively cool fluid such as air or other suitable gas.

Rolling-mill rolls (with helical passages for cooling water). C. ROTZEL. Brit. 285,358, Feb. 12, 1927.

Electric discharge apparatus. COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 635,999, June 15, 1927. Constructional features.

Electric discharge device for producing slight ultra-violet radiation. F. MEYER, H. J. SPANNER and E. GERMER (to Naamlooze Vennootschap Internationaal Octrooibureau). Brit. 285,068, Feb. 11, 1927. Devices for producing slight ultra-violet radiation, non-injurious to the eyes or other parts of the body, and applicable to sterilizing air of rooms or for other purposes, comprise a vessel which may be formed of quartz, uviol glass or the like (or having a window of such material), in which a glow discharge is produced between cold electrodes in an atm. of one or more rare or base gases and Hg or other metallic vapor. Various details are specified.

Annealing pot with reinforcing metal inside its corners. ROBERT S. STEWART (to American Brake Shoe & Foundry Co.). U. S. 1,685,966, Oct. 2.

Elements for filling heat regenerators. JOHN R. BUFFINGTON (to Decarie Incinerator Corp). U. S. 1,687,236, Oct. 9. Structural features.

Apparatus for feeding measured quantities of sodium aluminate or other dry materials. WILSON EVANS (to National Aluminate Corp.). U. S. 1,686,077, Oct. 2.

Apparatus for the determination of the size of grain in powders. M. S. KOSMAN and P. I. LUKIRSKII. Russ. 4110, Nov. 30, 1927.

Apparatus for dissolving sugar and the like with automatic regulation of the density. EDMOND LE BOS. Fr. 635,285, May 2, 1927.

Acid-resisting constructions. JOHANN K. WIRTH. Fr. 635,399, June 1, 1927. Mixts. of artificial phenol-aldehyde resins which can be hardened in the cold or at a moderate temp. by acid or acid salt are used for coating metals, or for cementing plates in acid-resisting constructions, or the constructions are made from the resins reinforced with Fe or the like.

Apparatus for grading heavy substances such as coal or ores. MIGUEL B. SUAREZ Fr. 635,240, May 30, 1927.

Crushing machine. ALLIS-CHALMERS MANUFACTURING COMPANY. Fr. 635,909,

June 13, 1927. A crushing machine for rocks, ores, coal, etc., is of the gyratory type, having two relatively rotating crushers which form between them an annular chamber narrowing toward the base. The axes or rotation of the two crushers intersect, so that they move eccentrically to one another.

Grinding machine for cement, lime, coal, phosphates, etc. SOCIÉTÉ DES TRANSMISSIONS MODERNES ET DES ENGINS BROYEURS. Fr. 635,243, May 30, 1927.

Control valve. SCHIFF AND STERN. Austrian 108,984, Oct. 15, 1927. A control valve operated by variations in fluid pressure is described, particularly for use in water-condensing plants.

Device for separating oil drops from steam. JOSEF MUCHKA. Austrian 108,935, Oct. 15, 1927. Constructional details.

Device for determining the resistance of bodies to friction. MOSES SPINDEL. Austrian 109,121, Nov. 15, 1927. Constructional and manipulative details.

Thermostat for controlling electric circuits. WELLINGTON J. SMITH. U. S. 1,687,230, Oct. 9.

Thermostatic control device for electric heaters. LEWIS H. LAMONT. U. S. 1,684,544, Sept. 18.

Thermostatic device for controlling electric circuits. HERBERT D. MONTGOMERY. U. S. 1,685,136, Sept. 25.

Thermostatic control device for electric circuits. IRA E. MCCABE. U. S. 1,686,-286, Oct. 2.

Thermostatic control for electric switches. HERBERT J. SAUVAGE (to Electric Thermostatic Control Co.). U. S. 1,686,766, Oct. 9.

Thermostatic regulator for electric circuits. AUGUST J. MOTTLAU (to Westinghouse Elec. & Mfg. Co). U. S. 1,686,634, Oct. 9.

Mercury relay for thermostats. A. I. DANILEVSKII. Russ. 4062, Nov. 30, 1927.

2—GENERAL AND PHYSICAL CHEMISTRY

GEORGE L. CLARK AND J. H. REEDY

Léon Guignard, 1852-1928. VERDA. *Schweiz. Apoth. Ztg.* **66**, 175–7(1928).—An obituary. S. WALDBOTT

Svante Arrhenius. OSSIAN ASCHAN. *Finska Kemistsamfundets Medd.* **36**, 66–75 (1927).—Biography with portrait. E. J. C.

Jean Werth (1855-1928). LÉON GUILLET. *Rev. métal.* **25**, 479–80(1928).—An obituary with portrait. A. PAPINEAU-COUTURE

Recent advances in science: Physics. L. F. BATES. Univ. London. *Science Progress* **23**, 203–11(1928).—A review of recent work on single crystals of Bi and Ni, the magnetic state of the Co" ion, the origin of magnetism, and contact differences of potential. JOSEPH S. HEPBURN

The saturated vapor pressure of solutions. M. LEVAL'T-EZERSKIĬ. *J. Russ. Phys.-Chem. Soc.* **59**, 89–111(1927).—A generalized form of Raoult's equation has been proposed (*C. A.* **21**, 3519) which holds for the osmotic pressure of any soln.: $(p-p_1)/p = ni/(N+in)$ where N is no. of mols. of water, n that of the solute and $i = \Delta t$ observed/Δt calcd. Setting Δt calcd. $= E$, we have: $(p-p_1)/p = \Delta t$ observed/(Δt observed $+ EN$), where Δt refers to f. p. depression or b. p. elevation. Assuming p to be the vapor pressure of water and p_1 that of the soln. at a given temp., the temp. rise necessary to make the vapor pressure of soln. reach the value of p, $\Delta t = ENp/(p_1 - 1)$. Since the ratio p/p_1 does not change with the temp. over a wide concn. range (*C. A.* **21**, 3519), Δt remains constant between 0 and 100°. Also, two solns. of equal vapor pressure at a given temp. will remain so at other temps. The Magnus formula for the vapor pressure of pure water ($p = p_0 \cdot 10^{\frac{at}{C+t}}$, where p_0 is pressure at 0°, t temp., $a = 7.4475$ and $C = 234.69$) applies to concd. solns. of KNO_3, K_2SO_4, $NaNO_3$, Na_2SO_4 and NaCl (exptl. data by Tammann and by Dieterici). The calcd. values were cor. for the difference between calcd. and observed values of the vapor pressure of water at corresponding temps. A single reliable observation is thus sufficient to compute the vapor pressure of a soln. (concns. up to 3 molar) at any temp. For more concd. solns. two observations at different temps. are necessary in order to correct for the non-conformance to Babo's law. The constants a and C of Magnus have the same value in all the cases considered. Or, the state of aggregation of water in solns. is the same as that of pure water. BASIL C. SOYENKOFF

A 5000-year-old aqueous solution. MAX MEYERHOF. *Arch. Cesch. Math., Naturwiss., Tech.* **10,** 336–7; *Chem. Zentr.* **1927,** II, 2209.—The communication describes a preservative fluid which was found in an Egyptian tomb, and consisted of a 3% aq. NaCl soln. contg. Na_2SO_4 as an impurity. It was used in ancient times as a *preservative agent for the internal organs of the dead.* C. C. DAVIS

The discovery of the gas laws. I. Boyle's law. W. S. JAMES. *Science Progress* **23,** 263–72(1928).—The law of Boyle and Mariotte was announced by Boyle in 1661, and by Mariotte in 1676. Boyle is therefore entitled to priority. J. S. H.

Problems of the Brownian molecular movement. FRIDA STADIE. *Ann. Physik* **86,** 751–97(1928).—This is a purely mathematical treatment of a no. of problems connected with the Brownian movement. W. W. STIFLER

Scientific and engineering symbols and abbreviations. J. FRANKLIN MEYER *et al.* *Mech. Eng.* **50,** 797–808(1928).—A list of symbols for hydraulics, aeronautics and electrical quantities, recommended by the Committee for Standardization of Scientific and Engineering Symbols and Abbreviations. T. S. CARSWELL

High-pressure-gas research at the University of Illinois. NORMAN W. KRASE. Univ. of Illinois. *Chem. Met. Eng.* **35,** 463–5(1928). E. H.

Hydrogen overvoltage and reduction of oxalic acid at mercury cathodes. P HERASYMENKO. *Z. Elektrochem.* **34,** 129–36(1928).—Researches (Heyrovsky, *C. A.* **19,** 2905; Herasymenko, *C. A.* **19,** 2905) have shown that the cathodic decompn. potential of H_2, at Hg, is greatly dependent on the H-ion concn., Heyrovsky giving an explanation in which H_2 is supposed to be produced in three steps. The relation between this potential and the H-ion concn. is detd. as: $\pi = (2RT/F) \ln[H^+] + k$, giving values in good agreement with expt. The relation between i (the current intensity) and the cathode potentials, at the temps. of the expts., is obtained as: $i = k \cdot [H^+]^{4/3} \cdot e^{-(2\pi F)/(3RT)}$, agreeing with the exptl. current-voltage curves. Contrary to Moeller (*C. A.* **2,** 2489), no max. in overvoltage is obtained between —4° and 10°, at Hg cathodes. The temp. coeff. of the potential of H_2 evolution at Hg cathodes is detd. as 0.003 v. per 1°, due to increased catalytic activity of H ions. Unlike other org. acids, oxalic acid influences the H overvoltage. The behavior of oxalic acid is explained by assuming that it forms the solvation compd., $H^+ (C_2O_4H_2)_n$, by reacting with H^+, the H^-, formed on the surface of the cathode, reacting with oxalic acid to give glyoxylic acid and H_2O. The relation giving the cathode potential of oxalic acid reduction is detd. as: $\pi = (RT/F) \lg [H^+]^2[O^-]^{2.4} + \pi_0$, where π_0 is the "normal" reduction potential of solns. molal in oxalic acid and normal in H ions. J. BALOZIAN

The practical value of physical apparatus and methods in the progress of the natural sciences. RICHARD KEMPF. *Chem.-Ztg.* **52,** 649(1928).—A review. R. D. BUMBACHER

A space model of the periodic system of elements. A. SLINGERVOET RAMONDT Kon. Inst. v. d. Marine, Helder. *Chem. Weekblad* **25,** 496–8(1928).—A description and photograph are given of a space model according to Monroe and Turner (*C. A* **20,** 3251) with loops of 2, 6, 10 and 14 elements. B. J. C. VAN DER HOEVEN

Atomic weight. A. v. FISCHER-TREUENFELD. *Ann. Physik* **85,** 1113–6(1928).—The at. wt. of an element is given approx. by the formula: $\sqrt[3]{W} = \dfrac{3\sqrt[3]{2Z} + 5\sqrt{(Z-1)/3} + 1}{8}$, where W is the at. wt. and Z is the at. no. R. L. H.

Combining ratio of copper and sulfur. Experiment for high schools. CHARLES H. STONE. Eng. High School, Boston. *J. Chem. Education* **5,** 1129–30(1928).—A high school quant. expt. on the formation of Cu_2S from Cu and S is described. Consistent results are obtained by students. L. D. R.

Eutectic freezing point lowering in binary mixtures. V. The determination of molecular weight from the position of the eutectic. E. KORDES. Kaiser-Wilh. Inst für Silicatforschung. *Z. anorg. allgem. Chem.* **173,** 1–13(1928); cf. *C. A.* **22,** 2100 – When binary systems contain satd. mixed crystals in the solid phases or incomplete miscibility in the liquid phase, departures from the general equation for eutectic f. p. lowering result which are qualitatively the same as for the f. p. lowering in dil. soln., that is, the f. p. is higher than the equation indicates. Quant. relations between the magnitude of the departures from the eutectic f. p. lowering for "normal" binary systems and the compn. of the mixed crystals or the gap in miscibility have not been discovered. The general eutectic equation provides a method for detg. mol. wts. which has the advantages over methods based upon the laws of Raoult and of van't Hoff that it is not limited to dil. solns. and is just as applicable to electrolytes as to nonelectrolytes. F. L. BROWNE

Coördination and atomic structure. PRIYADARANJAN RĀY. *Z. anorg. allgem. Chem.* **174**, 189–92(1928).—Complex compds. are divided into 2 classes, the strong or complete, and the weak or incomplete complexes. To the first belong Co^{III}; Pt^{II}; Pt^{IV}; Cr^{III}; Rh^{III}; Ir^{III}; Ir^{IV}; etc. These are so classed because of their extraordinary complexity and characteristic chem. properties. The weak complexes are transition forms between the true complexes and double salts or mol. compds. The various coördinating valences or bonds are arranged into pairs of partial orbits which show a linkage of the various electron orbits. The following factors may be considered as controlling the formation of complex compds.: (1) the charge of the central ion, which is the source of attraction; (2) the tendency of the central ion to assume the configuration of the next highest rare gas; (3) the nature of the electron arrangement in the central atom; (4) the coördinative groups must be constituted in such a way that 2 electrons may be transferred to the central atom for each coördinative binding. The influence of the vol. of the central ion is included in (1), the smaller the vol. the greater the attraction. An assumption which may be useful in considering the nature of the electron distribution in the central ion is that every 2 electrons tend to form a strong bond. A single electron in one of the outer orbits gives a seemingly unstable arrangement. The stability of each sub-group increases with the no. of electrons contained therein. Tables of the electron arrangement of various complexes are given.

L. L. QUILL

The shape of the carbon dioxide molecule. CLEMENS SCHAEFER. Univ. Breslau. *Physik. Z.* **28**, 667(1928).—Polemical against Stark and Blüh (*C. A.* **22**, 1510). S. distrusts many measurements of the electric moment of CO_2, and refuses to admit the linear shape of the mol.

A. L. HENNE

Role of valence and electrons in the teaching of general chemistry. W. M. BLANCHARD. DePauw Univ. *Proc. Indiana Acad. Sci.* **37**, 245–53(1927).—Combination, decompn. and displacement reactions may now be grouped together and explained on the grounds of valence changes if one assumes (1) an element in the free state has zero valence; (2) H in combination has a positive valence of 1, *i. e.*, each atom has lost one electron; (3) O in combination has a neg. valence of 2, *i. e.*, it has gained 2 electrons, but in peroxides one must assume it has a valency of —1. Excepting double decompn. reactions, chem. action in general may be interpreted as an oxidation-reduction process, *i. e.*, electronic transfer. Some elements tend to lose electrons, *e. g.*, Be, Cu, Au, etc.; some tend to gain them, *e. g.*, Cl, S, N, etc.; and some elements have a more equalized tendency. The reaction between an acid and a metal may be written $Zn \longrightarrow Zn^{2+} + 2e$ or $2H^+ + 2e \longrightarrow H_2$. To obtain SO_2 from H_2SO_4, S^{+6} must be reduced to S^{+4}; hence some element is required with not too great a facility for electronic acquisition or free S or even H_2S may be obtained. Some elements may play a double role and the atoms may acquire electrons from other similar atoms of the same element and self oxidation may occur as in HClO. B. illustrates this by the electronic events connected with Cl^{+7} and H_2O and also bleaching powder. He gives other examples in PH_3 and K hypophosphite, and the prepn. of iodine from either iodide or iodate. He considers the cases of $K_2Cr_2O_7$ with Fe^{+2}, Sn^{+2} and H_2SO_3. In $K_2Cr_2O_7$ + $FeSO_3$, would ferric sulfite or ferrous sulfate be first formed or would oxidation of Fe and S occur simultaneously? The interaction of Na_2O_2 and a chromic salt is considered with its implication of a structural formula for the peroxide and also the reaction between $KMnO_4$ and H_2O_2 in acid soln. Is there any inconsistency in regarding H_2O_2 as an oxidizing agent with a chromic salt and a reducing agent with $KMnO_4$? None, any more than there is in regarding Zn as electronegative to Mg and electropositive to Cu. No generally satisfactory explanation has been given of uncombined H_2 and Cl_2 being very stable, yet when mixed combining with great vigor. The possibility of 2 distinct kinds of atoms of chlorine, oxygen, nitrogen, etc., is indicated.

S. L. B. ETHERTON

An aspect of the problem of valence in inorganic chemistry. PAUL DUTOIT. *Bull. soc. chim.* **43**, 785–99(1928).—The present status of the application of valence to inorg. chemistry is considered. Suggestions are made for the assigning of polar valence numbers to elements in hitherto avoided compds. Cases where the polar valence number is zero and the possibility of isomerism through a difference in valence are discussed.

LUCY K. PICKETT

Modes in which valency is exercised. I. The tetrahedral carbon atom. Paraffins and polymethylenes. HENRY E. ARMSTRONG AND WM. BARLOW. *Chemistry and Industry* **47**, 892–7(1928).—A regular rhombic dodecahedron is chosen to represent unit valency; one of these represents a univalent atom; two in face contact a bivalent atom; three joined triangularly, a tervalent atom; four tetrahedrally, a quadrivalent

atom, as C, thus carrying further van't Hoff's original idea of the tetrahedral C. From these at. models, models of paraffins and polymethylenes have been built, showing the ways in which the atoms may be joined together. **II. The structure of graphite and black carbon.** H. E. ARMSTRONG. *Ibid* 897-8.—Since both black C and diamond yield graphite on heating, and since the ethenoid linkage has to do with color, A. suggests that graphite itself may be the missing equilibrated complex in the carbon scheme, and be composed of alternate diamond or normal paraffinic and ethenoid (black) carbon layers. G. R. YOHE

Specific heat and internal pressure of liquids. K. M. STAKHORSKIĬ. *J. Russ. Phys.-Chem. Soc.* **60,** 163-70(1928).—$M(C_p - C_v)$ varied little from the av. of 10.5 for 10 org. liquids. Association factors x calcd. for AcOH, MeOH, EtOH, BuOH and AmOH from $x = 10/[M(C_p - C_v)]$ (1) were in agreement with values otherwise obtained. Combining $M(C_p - C_v) = 0.0242\ T\alpha^2 Mv/\beta$ with $B = T\alpha/\beta$ (*Ann. chim. phys.* [4], **2,** 185(1864); **6,** 274(1865)), S deduces $B = M(C_p - C_v)/(0.0242\ Mv\alpha)$ (2) and $\beta = M\ (C_p - C_v)/(0.0242\ \Delta Mv)$. From (1) follows $B = 413.2/(xMv\alpha)$. (3). Values of internal pressure B obtained from (2) for normal liquids agree with those calcd. from (4) $B = 236\ \gamma t/_{k_n}$ (*C. A.* **21,** 2092). The agreement is also close for MeOH, and EtOH (about 3000 atm.) but not for H_2O at lower temps. B of associated liquids is of the same order of magnitude as of normal liquids. B. C. S.

The theory of the periodic system and the evolution of wave mechanics. A. SOMMERFELD. *Z. angew. Chem.* **41,** 1-6(1928).—An address presenting in popular form modern at. theories with especial reference to the contributions of the new wave mechanics of Schrödinger. G. L. CLARK

Germanium. L. M. DENNIS. *Z. anorg. allgem. Chem.* **174,** 97-141(1928).—A review article on the work done at Cornell Univ. on Ge between the years 1921 and 1927. The studies show the similarity in the properties of Ge and its compds. to those of the other elements in Group IV. Metallic Ge is similar in many respects to Si, *i. e.,* brittleness, high m. p., resistance to acid and alk. solns. Like Sn, it is distinctly metallic, forming well-defined crystals. H_2O_2 is the best solvent now known for Ge. In its compds., Ge shows variable valence, a property which increases in each group with at. no. increase. With the exception of CO and SiS, bivalent compds. of C and Si are either not known or not recognized. C and Si readily form compds. of higher valence; Ge shows the property of bivalence as well. GeO is easily prepd., is fairly stable in air, is definitely basic, reacts with halogen acids to form the dihalides, and reduces H_2O_2 and $KMnO_4$. With increasing at. no. in any group, the compds. of lower valence of the members show a greater stability. SnO and PbO are more stable than GeO; Sn^{II} exhibits reducing properties; Pb^{II} does not. Ge dihalides are not difficult to prep. although they are less stable than the corresponding Sn and Pb salts. Dihalides of C and Si are not known. The Ge dihalides are easily converted to the tetrahalides by the free halogen. $SnCl_2$ behaves similarly but $PbCl_2$ does not. Ge dihalides easily form compds. of the type $GeHX_3$ with the gaseous H halides, thus showing a similarity to C and Si but not to Sn and Pb, which do not form compds. of this type, except SnI_2HI. Ge, like Sn and Pb, forms a stable sulfide, GeS. The quadrivalent Ge compds. thus far isolated are similar to the corresponding Si compds., especially when the non-polar compds. with H and the halogens are referred to. Hydrated GeO_2 is formed by the decomposition of $GeCl_4$ with H_2O, the product formed being somewhat sol. as is the case with SiO_2. GeO_2 is reduced by H_2 at high temp. differing in this respect from Si. GeO_2 melts to a glassy form at very high temp. like SiO_2. It may be substituted for SiO_2 in glasses. GeO_2 differs from Si and Sn, in that it may be converted quickly and completely into $GeCl_4$ by heating with concd. HCl. GeS_2 is pptd. from solns. by H_2S, but since it is sol. in H_2O the pptn. is complete only in high acid concn. The tetrahalides of the elements from C to Pb in Group IV show a decreasing stability with increasing at. no. $PbCl_4$ decomps. readily. Ge tetrahalides are easily prepd. by the action of the halogens on the metal. GeF_4 and $GeCl_4$ may be prepd. by other methods as well. The stability of the tetrahalides decreases with increasing at. no. of the halogen. $GeCl_4$ is reduced with difficulty, while $SnCl_4$ is easily reduced. The similarity of the non-polar compds. of Ge, C and Si is shown in the hydrides of the type Ge_nH_{2n+2}; Sn and Pb show this property to a very slight extent. GeH_4, Ge_2H_6, and Ge_3H_8, have been prepd., and higher homologs are probably formed. Only a few org. compds. of Ge have been prepd.; yet from their methods of prepn. and properties, they show the close relationship of Ge to C and Si. A bibliography is included. L. L. QUILL

The hygroscopic and catalytic properties of electrolytic copper containing gelatin. C. MARIE AND P. JACQUET. *Compt. rend.* **187,** 41-3(1928).—Electrolytic Cu, deposited

in the presence of gelatin, contains a surcharge of gelatin, $CuSO_4$ and H_2O. The deposit is highly hygroscopic and when heated to 100° catalyzes the combination of H_2 and O_2. These properties show the high porosity of the deposits. E. G. V. B.

Some physical properties of platinum. A. T. Grigor'ev. *Ann. inst. platine (Leningrad)* **1928**, No. 6, 178-83.—Elec. cond. and hardness of a carefully purified sample of Pt have been measured. Elec. cond. measurements at 25° and 100° yielded: $\lambda_{25°}.10^{-4} = 9.190$; $\lambda_{100°}.10^{-4} = 7.248$; $\alpha_{25-100} = 0.00392$. The measurement of the hardness was carried out by the method of Brinnell (*Dingl. polytechn. J.* **320,** 280(1905)), yielding Brinnell nos. $H_{100} = 23.9$ and $H_{200} = 24.3$ for the pressures of 100 and 200 kg., resp. Furthermore, an analysis of the tech. Pt of the State factory in Swerdlowsk and detns. of its elec. cond. and hardness were carried out. The results are as follows: Impurities—Fe = 0.07%; Ir = 0.04%; Au = traces. $\lambda_{25}.10^{-4} = 8.736$; $\lambda_{100}.10^{-4} = 6.961$; $\alpha_{25-100} = 0.00372$; $H_{100} = 27.9$; $H_{200} = 28.8$. The elasticity limit of the tech. Pt was detd. to 3105.5 kg./cm². G. B. Kistiakowsky

The resistance hysteresis of tin, lead, indium and thallium at the temperature of liquid helium. W. J. de Haas and J. Voogd. Univ. Leiden. *Verslag Akad. Wetenschappen Amsterdam* **37,** 582-9(1928).—The hysteresis observed in the curves of resistance *vs.* magnetic field H at low temp. for Hg is confirmed on other metals. For tin (polycryst. wire, 3.60° abs., $R_{4.2°}$ = 0.00298 ohm.), the resistance changes with increasing H from 0 to 0.00128 at 21.40 gausses and with a few more small increases to the value 0.00268 at 50 gausses. On decreasing the field the first downward step of R is at 22.77 gausses to 0.00185 and the final one from 0.00162 to zero at 18.49 gausses. For indium (almost unicryst. wire, 3.01° abs., $R_{3.42°}$ = 0.001806 ohm) the upward rise begins at 60 gausses, the downward drop at 50.93 gausses. For lead (polycryst., 4.22° abs.) the up and downward curves continue to rise with H; they lie at 600 and 579 gausses, resp. The resistance of thallium (polycryst., 2.35° abs., $R_{4.2°}$ = 0.2452 ohm) starts upward from 0 at H = 25.08 gausses, continues to rise with H, reaches zero on decreasing H at 23.97 gausses. It is apparent that the hysteresis is a common effect for all supra-conductive metals; it is most marked for large crystallites in a homogeneous field. B. J. C. van der Hoeven

(Allotropic modifications of phosphorus.) Displacement of metals and their oxides by hydrogen under pressure at high temperatures. V. Ipat'ev. *Chimie & industrie* Special No., 411-4(April, 1928); cf. *C. A.* **21,** 1572; **22,** 2306.—According to I.'s most recent expts. white (colorless) P is formed: (1) by crystn. from C_6H_6 on cooling, but the cryst. aggregates are small; (2) the most perfect crystals are obtained by crystn. from C_6H_6 at about 200° and 60-70 atm.; they consist of long prisms which are transparent under the microscope and belong to the cubic system, as shown by the absence of double refraction under polarized light; (3) at 500° and over and 10 mm. or less, ruby-red P sublimes with transformation into white (colorless), cryst. P, m. 44.5°, d. 1.83, soly. in C_6H_6 0.65% at 15.6°. Red forms of P are obtained: (1) by heating ordinary P with Pb at 335° and 165 atm. in an atm. of N_2 or CO_2; under the microscope the crystals are ruby-red by transmitted light and violet with a metallic luster by reflected light; (2) by heating with powd. Fe or Mg the ruby-red crystals obtained are not violet by reflected light. All red forms have d. 2.11, ignite at 310-50° and are unaffected by polarized light, indicating that they crystallize in the cubic system. Analysis showed them to contain 99.5-99.9% P. Black forms are produced from ordinary yellow P and from red P by heating with H_2O at 200° or over, optimum conditions being 315° and 165 atm. They have d. 2.61, and contain over 99% P. Heating Pb with yellow P at 400° and 165 atm. gives fragile, cryst. P-Pb, d_{16}^{16} 3.68, contg. 65% Pb. 33% P and a slight insol. residue, corresponding approx. to PbP_3 but consisting of a solid soln. and not a chem. compd. Sn and yellow P at 285° and 90 atm. give a solid soln. of fragile crystals, d. 5.73, contg. 92.9% Sn and 7% P. Zn and yellow P at 250° and 100 atm. give blackish gray crystals of P-Zn contg. 91.46% Zn and 8.4% P, consisting of a solid soln. of ZnP_2 or Zn_3P_6 in excess Zn. Cu and yellow P at 350° and 105 atm. give homogeneous crystals contg. 85.75% Cu and 14.2% P, corresponding to Cu_3P. In all cases the metal and P were heated in CO_2 or N_2. The work reported on the reduction of Cu formate and $Cu(OAc)_2$ is abstracted in *C. A.* **20,** 2959; **22,** 13, and on $Pb(NO)_3$ in *C. A.* **22,** 2306. In order to confirm the theories proposed to explain the mechanism of the displacement of metals from salt solns. under the effect of H-ion concn., the effects of CO on $CuSO_4$ solns. at 160-220° and 20-100 atm. for 16 hrs. were studied. It was found that H_2O and CO reacted to give HCO_2H, which decompd. to give 2H and CO_2, and the results obtained confirmed the theories advanced on the effect of H-ion concn. on the reactions being studied. A. Papineau-Couture

The crystal structure of the alkaline earth metals. G. L. Clark, A. J. King and J. F. Hyde. Univ. of Illinois. *Proc. Nat. Acad. Sci.* **14**, 617–8(1928).—Very pure Ca, Sr and Ba are prepd. in a vacuum sublimation furnace, and samples, handled always in an atmosphere of argon, are subjected to x-ray analysis by the Hull method. Ca has a face-centered cubic structure in agreement with the results of Hull. Ba crystallizes on a body-centered cubic lattice with the const. 5.04 A. U. Sr has given patterns with very diffuse lines, at most, seven in number. The structure does not correspond to the face-centered lattice reported by Simon and Vohsen. It is evident that there are two or more modifications of Sr, and since it lies between Ca with face-centered and Ba with body-centered lattices, it is perhaps not strange that it should show anomalous results. The metal used was more than 99.9% pure. The work is being continued in an effort to discover the necessary conditions for production of sharp cryst. patterns. G. L. Clark

The crystal structure of solid mercury. M. Wolf. Univ. Groningen. *Nature* **122**, 314(1928).—The cryst. structure of solid Hg at —80° is detd. from powder photographs obtained with a special low-temp. spectrograph. A simple rhombohedral structure, agreeing with that of McKeehan and Cioffi (*C. A.* **17**, 2068) is found. R. J. H.

The value of the specific heats C_1 and C_2 of liquids and saturated vapors along the equilibrium line in the neighborhood of the critical temperature, also at T = 0 and a few remarked about the heat of vaporization at T = 0. J. J. van Laar. *Z. physik. Chem.* **134**, 311–28(1928).—A mathematical discussion. Near the crit. point, the sp. heat of the liquid C_1, and the sp. heat of the vapor C_2 tend, resp., towards $+\infty$ and $-\infty$. Near $T = 0$, the latent heat of vaporization tends towards a finite value (17.5 for He). G. Calingaert

The specific heats C_p and C_v of a few substances in the solid, liquid and hypercritical states between 80° and 320° absolute. A. Eucken and F. Hauck. *Z. physik. Chem.* **134**, 161–77(1928).—E. and H. det. sp. heats over a temp. range from 80° to 320° abs. Some of the figures reported are given below, in cal. per g. mol and °K. CO_2: C_p solid: 8.8 at 80°; 13.7 at 210°. C_s (sp. heat in satd. condition) liquid: 18.95 at 220°; 31.1 at 290°. C_v liquid: 10.4 at 230°; 13.35 at 320°. N_2O: C_p solid: 9.45 at 90°; 13.05 at 170°. A: C_s liquid: 10.55 at 90°; 15.30 at 140°. A: C_v liquid: 5.50 at 90°; 3.60 at 180°. C_2H_2: C_s liquid: 18.0 at 100°, 25.0 at 270°. C_2H_6: C_v liquid: 11.45 at 100°; 11.8 at 260°. Liquid air: C_s: 13.7 at 80°; 17.95 at 120°. Liquid air: C_v: 7.8 at 80°; 5.55 at 170°. MeCl: C_p solid: 11.65 at 90°; 15.30 at 150°. MeCl: C_p liquid: 17.45 at 190°; 18.17 at 240°. C_2H_4: C_p solid: 14.80 at 80°; 16.0 at 100°. C_2H_4: C_p liquid: 16.95 at 110°; 18.80 at 170°. *Heats of fusion:* A: 265.2 at 83.6°; CO_2 1900.3 at 215.6°; C_2H_4 699.0 at 103.6.° C_v shows no abnormal variation in the vicinity of the crit. point, while C_p does vary abnormally for all the substances tested. For A, C_v decreases rapidly with increasing temp., and approaches the value $3R/2$ 30° to 40° above the crit. temp. G. Calingaert

An allotropic form of silver. G. Allard. *Compt. rend.* **187**, 223–5(1928).—Cryst. Ag is cubic, face-centered, $a = 4.06$ A. U. A. studies the powder photograph of Ag pptd. from $AgNO_3$ by Cu (cf. *C. A.* **22**, 2108). This Ag is an allotropic form, rhombic-octahedral orthorhombic, $c = 4.23$, $a = b = 3.76$ A. U., $\alpha = 81°30'$. This corresponds to a rectangular parallelopiped unit cell of dimensions 4.23, 4.91 and 5.70 A. U. and with centered faces. The equidistances calcd. agree very well with those observed, and also with those obtained by Roux and Cournot (cf. following abstract). G. Calingaert

X-ray study of the crystal structure of deposits of metal pairs produced by simultaneous electrolysis. Albert Roux and Jean Cournot. *Compt. rend.* **186**, 1733–6 (1928).—The authors have studied by means of x-ray reflection diagrams, the effect of simultaneous deposition of metal pairs upon various metal cathodes. Cd-Ag, Cd-Sn and Cd-Ni, resp., were deposited upon duralumin and Cu-Zn upon steel. In no case were the characteristic spectra of the constituent metals obtained, but always a spectrum which indicated that a solid soln. or an intermetallic compd. had been formed. A. J. King

The crystal structure of some orthorhombic compounds of the type MX_2. I. H. Bräkken and L. Harang. *Z. Krist.* **68**, 123–38(1928).—$PbCl_2$, $PbBr_2$ and $HgCl_2$ belong to space group V_h^{16}. The unit cells contain 4 mols. and have the following dimensions: $PbCl_2$, 4.496, 7.667, and 9.153 A. U.; $PbBr_2$, 4.706, 7.989, 9.475; $HgCl_2$, 4.307, 5.936, 12.667. Possibilities for the at. positions are discussed. L. S. R.

The question of the structure of thallium-α and thallium-β. Harald Perlitz. Univ. Tartu, Esthonia. *Z. Physik* **50**, 433–5(1928).—Data for resistance and vol

changes at the transformation pt. Tl-$\alpha \longrightarrow$ Tl-β and at the m. p. of Tl-β point to the conclusion that Tl-α has a hexagonal close-packed structure, and Tl-β a face-centered cubic (close-packed) structure. Co, changing from hexagonal close-packed to cubic face-centered structure, has an almost identical resistance change, and approx. the same vol. change as Tl. Those metals which have close-packed structures approx. double their resistance on melting, and Tl-β exactly doubles its resistance on melting.

R. J. HAVIGHURST

The deposition of carbon from carbon monoxide and benzine in the presence of iron. ULRICH HOFMANN. *Ber.* **61B**, 1180–95(1928).—A continuation of the study of black carbon crystals (cf. *C. A.* **21**, 1039). In previous work on thermal decompns. of hydrocarbons temps. under 700° could not be employed. With an Fe catalyst C seps. from CO between 400° and 700°, and from benzine from 700 to 900°. The form or previous history of the Fe is without influence. The C samples so obtained were distinctly cryst. as proved by *x-ray analysis*, the grain size increasing with temp. of deposition. Numerous d., chem. and activity tests also depend on temp. The fact that crystals of C can be obtained at so low a temp. indicates formations of a carbide with the Fe with subsequent decompn. The formation of Fe_3C is not proved by x-ray analysis. However, at 400° with CO and at 700° with benzine appear diffraction lines for an unknown substance which is called *X-Carbide*, richer in C than Fe_3C.

G. L. CLARK

The preparation and crystal structure of the mono and diantimonides of palladium. L. THOMASSEN. Univ. Oslo. *Z. physik. Chem.* **135**, 383–92(1928).—A method for prepg. alloys of difficultly fusible and volatile elements is described, and PbSb and $PdSb_2$ are prepd. From the powder diagram it was concluded that PdSb has a Ni arsenide structure with a = 4.070 A. U., c = 5.582 A. U. and $PdSb_2$ has a pyrite structure with a = 6.439 A. U.

M. R. FENSKE

X-ray investigation of the structure of the carbon chains in hydrocarbons (C_nH_{2n+2}). J. HENGSTENBERG. *Z. Krist.* **67**, 583–94(1928).—$C_{35}H_{72}$ is orthorhombic, with 2 mols. in the unit cell of the dimensions a = 7.43, b = 4.97, and c = 46.2 A. U. The CH_2 groups are spaced in the direction of the c axis at intervals of 1.27 A. U. A mixt. of high-mol. paraffins showed the same simple CH_2 spacing. The basic symmetry is orthorhombic, space group V_h^{16}. H. proposes a zigzag arrangement of CH_2 groups, with adjacent C atoms 1.52 A. U. apart.

L. S. RAMSDELL

X-ray investigation of the structure of some naphthalene derivatives. JOHN MONTEATH ROBERTSON. *Proc. Roy. Soc.* (London) **A118**, 709–27(1928).—The crystal structures of 1,2,3,4-tetrachloro-1,2,3,4-tetrahydronaphthalene and of 1,2,3,4,5,8-hexachloro-1,2,3,4-tetrahydronaphthalene examd. by the rotating-crystal method are found to be closely similar. The former has a 7.9, b 10.3, c 14.2 A. U., β 112° 40′, d 1.67; the latter a 7.8, b 12.3, c 13.9 A. U., β 116° 14′, d 1.87. The lattices are monoclinic body-centered with 4 asymmetric mols. in the unit cell, and the most probable space-group is C_s^4. This involves a polar mol. By means of Bernal's method of interpretation, indices are assigned to all the reflections. Information is also obtained as to the approx. location of the halogen atoms, which virtually lie on a different type of lattice. A qual. examn. and comparison of the intensities of the most important reflections indicate that the two addnl. substituted Cl atoms in the hexachlorotetrahydronaphthalene must lie somewhere beneath the other halogens when the structure is viewed along the c axis. The facts are accounted for if it is assumed that the long axis of the mol. coincides with the c axis of the crystal. The intensity distribution in the higher orders of certain planes requires an almost flat C ring, as in the graphite structure.

B. C. A.

The theory of crystal growth. IVAN N. STRANSKI. *Z. physik. Chem.* **136**, 259–78 (1928).—On the assumption that the surface of a crystal has practically the same cryst. structure as the inside of the crystal and that mols., on crystn., tend to go to the place of min. energy, S. calcs. the repulsive forces at various places in the crystal and concludes that in a crystal of the NaCl type only the (100) surfaces are stable, that the surfaces (110) and (111) are (in vacuum) only imaginable as a great no. of cube surfaces which are grouped in dome or pyramid formations, that two-dimensional cryst. kernels are formed on the cube surface on growth, and that the ions or mols. crystallize out most easily on a cube corner, then on an edge, and most difficultly on the middle of a surface. Soln. takes place in the reverse order.

MALCOLM DOLE

Crystal structure information from 1913 to 1926. P. P. EWALD AND C. HERMANN. *Z. Krist.* **65**, Special suppl. 65–96; **66**, 97–224(1927); cf. *C. A.* **21**, 3774.—The structures of the remaining elements are given, and there is a general tabulation of compds. of the type AB. Included are description and references to all structure detns. of compds.

of the type AB; and a general discussion of compds. of the type AB_2, with the first part of the descriptions of this type. L. S. RAMSDELL

Morphotropic families. E. HERLINGER. *Fortschritte Mineral. Kryst. Petrog.* **12**, 43–4(1927).—A brief discussion of morphotropic families and space groups. J. F. SCHAIRER

Crystal orientation in cast plates of metals. RUDOLF VOGEL. *Neues Jahrb. Min. Abt. A, Beil.-Bd.* **53**, 229–40(1926).—Microscopic studies on the orientation of crystals in plates of Pb, Al, Sn, Zn, Cd, Sb and Bi. J. F. SCHAIRER

The loosening, the reactivity and the electrical conductivity of the crystal lattice. J. ARVID HEDVALL. *Svensk. Kem. Tid.* **40**, 65–98(1928).—A detailed review and discussion of the work on elec. cond., lattice type (*i. e.*, ionic or mol.) and loosening of the crystal lattice and their relation to the reactivity of crystals in reactions between solids. R. L. HERSHEY

Toluyl enol. S. RÖSCH. *Fortschritte Mineral. Kryst. Petrog.* **11**, 327–8(1927).—Enolic toluylbenzoylmethane, $C_6H_4MeC(OH)CHBz$, forms orthorhombic tablets $a:b:c = 3.092:1:1.66$. The index of refraction increases from red to violet. $\alpha = 1.635–1.690$, $\beta = 1.644–1.805$, $\gamma = 1.932–2.359$. The birefringence is very strong. J. F. SCHAIRER

The mechanical twinning of zinc crystals. E. SCHMID AND G. WASSERMANN. *Z. Physik* **48**, 370–83(1928).—New observations on Zn crystals extended to the breaking point confirms Mathewson and Phillips (cf. *C. A.* **21**, 1083), *i. e.*, that the secondary extension is due to a secondary translation upon a lattice plane which has been introduced by twinning. The observations were both microscopic and roentgenographic. That the secondary translation is on the basal plane is shown by the six-fold symmetry of a Laue picture taken perpendicular to the translation plane. The actual extension due to twinning is very small compared to the total extension; but the twinning is highly important since it allows the second translation to take place. The mech. twinning appears to cause a sudden increase in tensile strength of the basal translation plane, the increase amounting to approx. a doubling. R. L. HERSHEY

X-ray studies of the nitrides of iron. GUNNAR HAGG. Inst. of Metallography, Inst. of Gen. and Inorg Chem. of the University, Stockholm. *Nature* **122**, 314(1928); cf. *C. A.* **22**, 4056.—Further studies of the nitrides of Fe indicate that in the γ-phase, which was previously reported to be a solid soln., the N atoms have a definite location in the Fe lattice, which for γ-Fe is face-centered cubic. It is tentatively suggested that there is one N atom per unit cell, located either at the center ($^1/_2, ^1/_2, ^1/_2$), or at the position $^1/_4, ^1/_4, ^1/_4$. A. W. KENNEY

Atomic arrangement in crystals of the alkali thiocyanoplatinates. STERLING B. HENDRICKS AND HERBERT E. MERWIN. *Am. J. Sci.* **15**, 487–94(1928).—Laue and spectrum x-ray pictures served to det. the at. arrangement in crystals of NH_4, K and Rb thiocyanoplatinates. The crystals are hexagonal. The units contg. $1R_2Pt(SCN)_6$ have the following dimensions: (NH_4), $a = 6.77$ A. U., $c = 10.45$ A. U.; (K), $a = 6.73$ A. U., $c = 10.26$ A. U.; (Rb), $a = 6.75$ A. U., $c = 10.47$ A. U. The at. arrangement is: Pt at 000; alkali at $\frac{12}{33}v$; $\frac{21}{33}\bar{v}$ with v about 0.50; S, C and N at $u\bar{u}v$; $2\bar{u},\bar{u},v$, $u,2u,v$; $\bar{u},u,\bar{v}$; $2u,u\bar{v}$; $\bar{u},2\bar{u},\bar{v}$, with $u_s = 0.10$ to 0.17, $v_s = 0.09–0.135$; or Pt at 000 alkali at $\frac{1}{3},\frac{2}{3},\frac{1}{2}$; $\frac{2}{3},\frac{1}{3},\frac{1}{2}$; S, C and N at uuv, $o\bar{u}v$, $\bar{u}ov$, $uo\bar{v}$, $\bar{u}\bar{u}\bar{v}$, $ou\bar{v}$, with $u_s = 0.17–0.24$ 0.09–0.135. The S atom in either of the two possible arrangements is adjacent to the Pt atom. R. L. HERSHEY

Röntgenographic studies of manganese arsenide, iron telluride, nickel stannide and platinum stannide. IVAR OFTEDAL. *Z. physik. Chem.* **132**, 208–16(1928).—Specimens of *MnAs*, *FeTe*, *NiSn* and *PtSn* were examd. by the x-ray powder method The prepns. were probably of the general type R_x,M_y, it not being certain that the 2 elements were present in the exact stoichiometric relation. The elementary cells are hexagonal the dimensions being as follows: MnAs, $c = 5.704 \pm 0.006$, $a = 3.716 \pm 0.003$; FeTe, $c = 5.651 \pm 0.005$; $a = 3.800 \pm 0.003$; NiSn, $c = 5.174 \pm 0.003$, $a = 4.081 \pm 0.002$; PtSn, $c = 5.428 \pm 0.005$, $a = 4.103 \pm 0.003$, all in A. U. For MnAs and PtSn the NiAs structure type seems certain; for FeTe and NiSn it seems at least probable. R. L. HERSHEY

The differentiation of right- and left-hand forms with the aid of x-rays. A. HETTICH. *Z. Physik* **48**, 614–5(1928).—X-rays introduce, in the process of diffraction, an apparent center of symmetry into a crystal, so that, as is known, there are only 11 and not 32 symmetry classes distinguishable by x-rays. However, the Laue spots from 2 similarly

placed crystals of the same class and compn., but one right-handed and one left-handed, will not coincide in absolute position. It is suggested that quartz, *e. g.*, its positive and negative edges having been detd. by piezoelectric expts. and hence its position being known, can be detd. as either right- or left-handed by a simple reflection expt. from one of the prism faces. R. L. HERSHEY

The form of crystals of artificial vivianite. G. CESÀRO. *Bull. sci. acad. roy. Belg.* [5], **14**, 260–4(1928).—A fairly large and well-developed clinorhombic crystal of artificial *vivianite* was examd. under the microscope. The principle faces are 010, 100, 403 and 105. The angles between faces are: 100–105, 66°; 100–403, 147°; 105–403, 147°. The principal optical axis is perpendicular to 010. R. L. HERSHEY

Röntgenographic studies of the structure of the oxides of iron. H. GROEBLER. *Z. Physik* **48**, 567–70(1928).—Fe_2O_3 was reduced by CO at 800°. The equil. between the solid phase and CO in the gas phase is plotted. Debye-Scherrer pictures of the variously composed solid phases were taken. The first pictures of prepns. having an FeO content up to 5%, show an expanded Fe_3O_4 lattice; with higher FeO content, the FeO lines themselves appear. The Fe_3O_4 lattice continues to shrink up to about 39% Fe_3O_4; the FeO lattice shows no change up to pure FeO. The last pictures show the FeO lines and the strongest lines of pure Fe. FeO forms a solid soln. with Fe_3O_4 up to 5% FeO, after which it appears as a separate component. Fe is only slightly sol. in FeO under these conditions, since the FeO lattice shows no displacement of its lines in the specimens having free Fe present. R. L. HERSHEY

Growth forms of alum. HANS HIMMEL. *Neues Jahrb. Min. Abt. A, Beil.-Bd* **54**, 88–125(1926).—A study of growth forms of potash-alum crystals with many sketches. J. F. SCHAIRER

Zigzag borders (wrinkled borders) and related polarization forms in crystals and crystal aggregates. F. BERNAUER. *Neues Jahrb. Min. Abt. A, Beil-Bd.* **55**, 92–143 (1926–7). J. F. SCHAIRER

Are the growth phenomena derived from the solution phenomena through the reversal of signs? R. GROSS AND H. MÖLLER. *Neues Jahrb. Min. Abt. A, Beil.-Bd.* 53, 95–133(1926).—Expts. were made on the growth from soln. on polished spheres of halite and sylvite. Parallel growths with corners and projecting angles resulted. A long mathematical discussion of the difference between the forms produced by growth and soln. of crystals is given. Under growth conditions faces in the final form remain smooth and during soln. these become roughened. A formula is derived for the concn. curve of a satd. soln. with decreasing temp. and the formation of crystal nuclei. J. F. SCHAIRER

Deformation structures of aluminum crystals and crystal masses and their reciprocal relations. E. SCHIEBOLD. *Fortschritte Mineral. Kryst. Petrog.* **11**, 25–8(1927).—The effects of crushing, rolling, drawing and torsion on Al crystals were studied. J. F. SCHAIRER

The lattice constant of barium telluride. MAX HAASE. *Z. Krist.* **68**, 119–22 (1928).—BaTe is cubic, and the side of the unit cell was found to be 6.82 ± 0.02 A. U. from a powder photograph taken with Cu radiation and standardized with NaF, or 6.86 ± 0.04 when Mo radiation was used. L. S. RAMSDELL

The crystal structures of monomethyl ammonium chlorostannate and chloroplatinate. RALPH W. G. WYCKOFF. Rockefeller Inst., New York. *Am. J. Sci.* **16**, 349–59(1928).—The at. arrangement in crystals of $(MeNH_3)_2SnCl_6$ has been detd. from a study of Laue and spectrum photographs. The at. grouping is a distortion of the CaF_2 structure. The unit cell is rhombohedral, contains one mol., and has the dimensions $\alpha = 50° 14'$, $a_0 = 8.42$ A. U. The at. arrangement corresponds to space-group 3 Di-5 with the Sn atom at 000, Cl atoms at uuv; uvu; vuu; $\bar{u}\bar{u}\bar{v}$; $\bar{u}\bar{v}\bar{u}$; $\bar{v}\bar{u}\bar{u}$, where $u = 0.225 \pm 0.01$ and $v = 0.26 \pm 0.01$. C and N atoms are at uuu; $\bar{u}\bar{u}\bar{u}$, u_C and u_N being probably about 0.31 and 0.27, resp. Crystals of $(MeNH_3)_2SnBr_6$ and $(MeNH_3)_2PtCl_6$ have very similar arrangements. For the latter, the single-mol. unit cell has dimensions $\alpha = 48° 46'$ and $a_0 = 8.31$ A. U. R. J. HAVIGHURST

The Raman effect in crystals. K. S. KRISHNAN. *Nature* **122**, 477–8(1928).—Monochromatic light scattered from crystals is accompanied by secondary radiation of altered wave length, the difference between incident and scattered frequencies corresponding to a characteristic infra-red frequency of the crystal. When the 4358 A. U. group of the Hg arc is scattered by quartz, the wave lengths of the longest scattered radiations are 118, 94, 78, 48.5, 37.4, and 21.5μ. R. J. HAVIGHURST

X-ray diffraction in solutions and liquid mixtures. I. P. KRISHNAMURTI. *Indian J. Physics* **2**, 501–7(1928).—A tube with Cu anticathode, operated at approx. 40 kv., was used to photograph the x-ray diffraction patterns of NH_4NO_3 and acetamide, both

in powd. form and in aq. solns. of various concns. With concd. solns. the development of an inner ring indicates the existence of a regular space array just as in the liquid or solid states. Unlike concd. acetamide solns., concd. solns. of NH_4NO_3 give a certain amt. of general scattering, probably due to ions distributed at random in the liquid. The 2 rings which appear in the solid state appear also in the liquid state and in very concd. solns., but both of them undergo some contraction. As the diln. increases the inner ring contracts and tends to disappear as a general halation, while the outer ring, if smaller than the ring for H_2O, expands and merges with it as the diln. is increased. Hence the outer ring is considered as a superposition effect due to H_2O and the solute in proper proportions. A no. of excellent reproductions of the radiograms characteristic of the different dilns. are included. W. W STIFLER

Examination of liquids by x-rays by the method of the "rotating crystal." D. COSTER AND J.-A. PRINS. *J. phys. radium* [6], 9, 153-5(1928).—A *special camera for obtaining liquid diffraction pictures* from liquids having heavy atoms has been made. It consists of an x-ray tube, electron type, mounted on a movable arm, the axis of rotation being horizontal and lying in the surface of the liquid to be examd. A small cylindrical camera is fastened to the end of the x-ray tube, its axis coinciding with the axis of rotation. The procedure is to place the liquid, in a suitable tray, within the camera, and expose the film with different angles of incidence between the liquid surface and the x-ray beam. A greater effective intensity of the diffracted beam is thus obtained than by the usual method. Hg has been examd. and reveals 3 amorphous rings. R. L. HERSHEY

The molecular forces in crystal growth. W. KOSSEL. *Physik. Z.* 29, 553-5 (1928).—The rate of crystal growth is studied in relation to the energy released when an atom or an ion is added to the lattice. Such an addn. may be made in 3 ways: to the end of a row of atoms; to the edge of an uncompleted plane of atoms; and to the surface of a completed plane. Two cases are considered, those of homopolar and heteropolar crystals. In the first a cubic lattice is assumed and the effects of the 26 nearest neighboring atoms are considered and the relative magnitudes of the energies for the above three cases are calcd. It is apparent that the (100) faces will grow less rapidly than the (110) and hence will persist in the crystal form. Similar considerations for the 100 faces of a heteropolar crystal such as NaCl show that on these faces growth is in the following order, uncompleted rows are completed, a new row is started and completed, etc., until the plane is complete, the next atom. is added on the surface of this plane and the cycle begins over. Thus (100) faces grow as true planes. (110) faces, however, grow as a series of ridges formed by the junctions of (100) planes. These ridges have alternately positive and negative ions on their edges. The intervening space between ridges is not filled to form a true (110) face, since this would require the placing of ions exactly between 2 others of like sign. R. L. HERSHEY

The crystal as a homogeneous polyhedron. J. BECKENKAMP. *Neues Jahrb. Min. Abt. A, Beil.-Bd.* 54, 1-71(1926); cf. *C. A.* 21, 679.—Axes of rotation L' of 360° and L'' of 180° are of 2 kinds, the second kind involving an alternating reflection or an inversion center. The 32 crystal symmetry-classes are derived. The derivations and nomenclature are too long to present in an abstract. J. F. SCHAIRER

The equilibrium between methylate and hydroxyl ions in mixtures of methanol and water. II. Investigations by means of electrometric hydrogen-ion measurements. AUGUSTA UNMACK. *Z. physik. Chem.* 131, 371-88(1928); cf. *C. A.* 22, 1715.—The H-ion activity in mixts. of MeOH, H_2O and methylate of K or Na at 18° was detd. by e. m. f. measurements on cells of the type

$$H_2 \left| \begin{matrix} CH_3OH \\ KOH, KOCH_3 \\ H_2O \end{matrix} \right| KCl(3.5N) \mid KCl(0.1N) \mid HgCl \mid Hg$$

The concns. of methylate used were 0.1, 0.01 and 0.00333 M, while the concn. of MeOH varied from 0 to 24.9 M. The equil. const. of the reaction $OH^- + CH_3OH = OCH_3^- + H_2O$ was calcd. to be about 0.47. E. R. SMITH

X-ray diffraction and its bearing on the molecular complexity in the liquid state. P. KRISHNAMURTI. *Indian J. Physics* 2, 491-500(1928).—X-ray diffraction patterns were photographed for 26 pure org. liquids. In every case in which the surface tension method indicated mol. assocn., the photographs showed a prominent inner ring. When the Ramsay-Shields formula for computing the degree of assocn. from surface tension data is modified by substituting x-ray values for the spacing in place of m/d, the results for these liquids are much more probable and certain anomalous values previously obtained are rectified. Nearly all the liquids examd. showed assocn. to some extent and it is suggested that these can be treated as solns. of double or triple mols. in a solvent com-

posed of single or double mols., resp. A no. of excellent reproductions of the x-ray diffraction patterns are included. W. W. Stifler

The crystalline liquid state as a general property of matter. I. Vectorial aggregation, fluid structure and stream-double refraction of barium sulfate ultramicrocrystals. P. P. von Veimarn. *Kolloid-Z.* **44**, 279–88(1928).—The results of a microscopical and ultramicroscopical examn. of $BaSO_4$, pptd. by mixing concd. solns. of $MnSO_4$ and $Ba(CNS)_2$, support V.'s claim that the state of aggregation of the ppt. depends not so much on the properties of the pptd. substance as on the physicochem. conditions of pptn. Five stages can be distinguished in the pptn. of $BaSO_4$: (1) chem. reaction, (2) formation of highly supersatd. and assocd. soln. of $BaSO_4$, (3) production of very concd., highly disperse colloidal soln., (4) vectorial aggregation in this colloidal soln., (5) destruction in consequence of aggregative crystn. (formation of larger ultramicro- or micro-crystals). An increase in viscosity occurs during the processes (1) to (4), the substance changing from a thick oil of sirupy consistence to a gelatinous membrane. With $BaSO_4$, states (1) and (2) are passed through rapidly. B. C. A.

The crystal class of the pentaerythritols and the tetrahedral carbon atom. A. Schleede and A. Hottich. *Z. anorg. allgem. Chem.* **172**, 121–8(1928); cf. *C. A.* **22**, 895.—By means of Meissner's method for the detection of piezoelec. charges and etch figures produced with MeOH the pentaerythritols are shown to belong to the tetragonal system with bisphenoidal symmetry S_4. The pentaerythritol mol. is not pyramidal but tetrahedral and remains completely in harmony with the classical stereochemistry of van't Hoff and Le Bel. Claim is made that the only exptl. support for the existence of pyramidal mols. of the methane type is in error. The geometric stereochem. system of Weissenberg, held to be general, must be limited. H. W. Walker

X-ray study of some simple ethane derivatives. I and II. (Miss) K. Yardley. *Proc. Roy. Soc.* (London) **A118**, 449–84, 485–97(1928).—I. A detailed investigation has been made of crystals of C_2Cl_6, C_2Br_6, $C_2Cl_4Br_2$ (two forms), C_2Br_5F, $C_2Cl_3Br_3$ and $(MeCBr_2)_2$ (two unstable orthorhombic forms, one obtained below 0°). These substances form an isomorphous series, crystg. in the space-group Q_h^{16}. C_2Cl_6 has $a\ b.c$ = 1.1350:1:0.6302; C_2Br_2, $a:b:c$ = 1.1278:1:0.6270; $C_2Cl_4Br_2$ (symmetrical form), $a:b:c$ = 1.1308:1:0.6270; (asymmetrical form), $a:b:c$ = 1.1220:1:0.6288; C_2Br_5F, $a:b:c$ = 1.1012:1:0.6098; $C_2Cl_3Br_3$, $a:b:c$ = 1.1270:1:0.6262; $(MeCBr)_2$ (low-temp. form), $a:b:c$ = 1.073:1:0.601; (ordinary-temp. form), $a:b:c$ = 1.1206:1:-0.6296. There are 4 mols. in the unit cell, each possessing a plane of symmetry parallel to (010). This plane passes through the 2 C atoms and two of the halogen atoms (or the 2 Me groups in $(MeCBr_2)_2$), with the other 4 halogen atoms arranged in pairs on either side. In C_2Cl_6 and C_2Br_6, and probably in $(MeCBr_2)_2$, the mols. also possess a pseudo-center, which produces additional halvings not expected from space-group considerations. The symmetry of the C valencies is deduced from the mol. symmetry and it is shown that the C atom possesses 2 A and 2 B valencies, possibly identical with the two (2,1) and two (2,2) electrons in the outer group of neutral C. Composite *F* curves obtained for C_2Cl_6 and C_2Br_6 are compared with Hartree's curves for Cl^- and C^{++++} (cf. *C. A.* **19**, 2910). The formula of both forms of $C_2Cl_4Br_2$ appears to be $CCl_3.CClBr_2$. II. $(MeCBr_2)_2$ possesses a stable tetragonal form, which bears no apparent resemblance to the 2-forms described above, and has *a* 8.80₆, *c* 11.27 A. U. d 2.818. The unit cell probably contains 4 mols. in face-centered positions. $(Me_2CBr)_2$ forms needle-like tetragonal crystals having $a:c$ = 1:0.7798 and d. 1.811. There are 4 mols. in the unit cell occupying approx. face-centered positions, and possessing either a plane or dyad axis of symmetry or both. The mols. themselves simulate tetragonal symmetry. There are 2 possible types of structure, which are illustrated. $Me_3CCBrMe_2$ forms needle-like crystals very similar to those of $(Me_2CBr)_2$. The orthorhombic cell has *a* 21.35, *b* 10.77, *c* 7.84 A. U., d. 0.85; it may be divided into two pseudotetragonal parts, the arrangement of mols. in each resembling that in the unit cell of $(Me_2CBr)_2$. The space-group is C_{2v}^{21}. B. C. A.

Radiate crystallization. B. Popov. *Fortschritte Mineral. Kryst. Petrog.* **11**, 320–1(1927).—The phenomenon of radiate crystn. was investigated with *malonamide* and *resorcinol*. J. F. Schairer

So-called rhythmic crystallization. F. Bernauer. *Fortschritte Mineral. Kryst. Petrog.* **12**, 14–5(1927).—A discussion of types of rhythmic crystn. with examples for demonstration. J. F. Schairer

Diffusion rings and crystallization rings. G. Linck and E. Korinth. *Z. anorg. allgem. Chem.* **171**, 312–6(1928).—S was dissolved in CS_2 thickened with Canada balsam or rubber. Upon dilg. the soln. a cloud of droplets of S appears, the larger droplets

growing at the expense of the smaller, and some finally becoming surrounded by a space entirely free of droplets. The phenomenon is more striking in case a crystal of S forms, for it rapidly absorbs all the droplets in the immediate neighborhood and, as it grows, droplets at the edge of the clear space gradually dissolve and the space grows in extent. The droplets apparently move toward the crystal, dissolving on the way. An apparently new tetragonal modification of S was identified in the course of the work. This new modification spontaneously transforms into a second bright yellow liquid modification. R. L. HERSHEY

The effect of nitrocellulose upon the velocity of crystallization of gelatinizing solvents. ANNIE MILLICENT KING. Univ. of Bristol, Eng. *Trans. Faraday Soc.* **24**, 453-62(1928).—The linear velocity of crystn. of solns. of nitrocotton in concns of 0.2-2% in benzophenone, phenylurethan, diphenylurethan and formanilide was measured. The nitrocotton contained 0.27% ash, 12.10% N, and was 99.45% sol. in alc.-ether mixt. For benzophenone, the rate of crystn. was lowered by increase in concn. of nitrocotton. With diphenylurethan the phenomenon of polymorphism complicates measurements. The α-form has the highest rate, the γ the lowest. Innoculation of the solns. was necessary, and there was interference by spontaneous crystn. from point sources along the tube. Phenylurethan showed 3 forms, but it was not possible to isolate the α form. Formanilide showed 2 forms. From previous unpublished data on triphenyl phosphate, ethylphenylurethan, *o*-tolylurethan and benzyl formanilide with the results of above measurements, it is concluded that the extra time taken for crystn. in the presence of nitrocotton is exactly parallel to the reputed *gelatinizing power* of the solvent. ARTHUR FLEISCHER

Relation between water and salts in crystalline hydrates and in solutions. J. N. RAKSHIT. *Z. Elektrochem.* **33**, 578-81(1927); cf. *C. A.* **20**, 3118.—The mol contraction observed when a salt forms a cryst. hydrate or a soln. with water has been detd. for various salts. The values obtained for solns. are generally greater than those for the cryst. hydrates and increase notably with diln., but for concd. (including super-satd.) solns. of NaOAc the mol. contraction is less than for the trihydrate, and for $MnSO_4$ solns. it is almost negligible compared with the values for the cryst. hydrates. For solns. of Na_2SO_4 and of Na_2CO_3 at various concns., the mol. contraction has been measured at various temps. between 15° and 90°, but no indication of transition points corresponding with dissocn. of definite hydrates is obtained. It is inferred that the relation between the salt and water in solns. is different from that in the cryst. hydrate B. C. A

The equation for quantizing a molecule composed of *n* electrified particles. TH DE DONDER. *Bull. sci. acad. roy. Belg.* **13**, 756-67(1927).—Using his method (*Ibid* **13**, 693(1927)), D. obtains the Schrödinger equation generalized to apply to a mol. with interaction. The equation is relativistic and additive. F. R. B.

Tensile properties of crystals of an "ennobled" aluminum alloy. R. KARNOP AND G. SACHS. *Z. Physik* **49**, 480-97(1928); cf. *C. A.* **21**, 1730.—Single crystals of an alloy contg. approx. 95% Al and 5% Cu were prepd. by straining and heating wires of the alloy. The orientation was detd. by Laue photographs, the (111) direction being the preferred direction of growth; none was oriented in the (110) direction. Most of the crystals were quenched from 525° in H_2O and annealed at 100°; the others were cooled slowly from 525°. In tensile tests the quenched ("ennobled") crystals behaved like Al crystals so far as slip was concerned. Four crystals were examd for orientation, after break, by the rotating-crystal method and found to agree very closely with the orientation predicted from the slip mechanism of Al. In the tensile tests the load at the beginning of slip varied from 18 to 36 kg./mm.² for the quenched crystals and depended upon orientation; the "effective tension" on the glide plane, however, was const. at 9.3 kg./mm.² with a mean deviation of ±8%. In the unquenched crystals the variety of orientation was not so great and the tension *vs.* cross section decrease curves were better grouped. The type of break depends upon the orientation as follows: the break for orientations in the region between (111), (100) and (110) is a single flat surface, which in the unquenched crystals was inclined at approx. 45° to the wire axis, and in the quenched crystals at angles depending on the orientation; with orientations approx. along (111) several plane surfaces appeared on the break, the angles between having no apparent significance; with orientations along (100) no plane surfaces appeared on the break, but like an ordinary wire, a decided drawing. Laue pictures of quenched and unquenched crystals show only sharper spots and slightly less asterism for the unquenched. The tensile properties are greatly changed by quenching, the "effective tension" on the glide plane increasing from 2 to 9.5 kg./mm.² The extension is not greatly different. The unquenched crystals recrystallize at

330–340°; the quenched at 450–470° and in larger crystals than the unquenched. The change in properties with quenching is apparently due to a particular state of the crystal lattice. R. L. HERSHEY

Single crystals of iron. IV. Dependence upon temperature of the magnetization of single crystals of iron. ERNST DUSSLER. Tübingen. *Z. Physik* **50**, 195–214 (1928).—The magnetization of single crystals of Fe, parallel to the digonal and tetragonal axes, was investigated at various temps. between liquid air and the Curie point. For all temps. the magnetization curves were essentially similar, consisting of an initial linear ascent, the slope of which is *independent* of the temp., which goes over with a sharp, definite break into the part of the curve corresponding to satn. The height of this break, and therefore the satn. value of the magnetization decreased with increasing temp. apparently according to an exponential law. At higher temps., satn. is reached at lower fields. It has the same value for both crystal directions, although it is reached at lower fields for the tetragonal than for the digonal direction. W. W. STIFLER

Studies of physical purity by means of x-ray powder diagrams. N. H. KOLKMEIJER. *Z physik. Chem.* **136**, 45–8(1928).—See *C. A.* **22**, 1066, 2500. R. L. H.

Direct determination of Thomson coefficients in single-crystal zinc rods. L. A. WARE. State Univ. of Ia. *Proc. Iowa Acad. Sci.* **34**, 282(1927).—The Thomson coeffs. for a single crystal of Zn as a function of the orientation of the principal cryst. axis are being directly detd. by Nettleton's method. For a rod with an orientation angle of approx. 45°, the coeff. shows a rise with increasing temp. over the range 50–250°. W. G. GAESSLER

Determination of specific gravity of powders. H. RASQUIN. *Farben-Ztg.* **33**, 1786–7(1928).—The sp. gr. of powders insol. in and heavier than water is detd. by introducing 10 g. of the substance through a funnel into 10 cc. of water in a measuring cylinder, the exit tube of the funnel being kept just clear of the water. The sp. gr. is found by dividing 10 by the increase in vol. in cc. B. C. A.

Further observations on sulfur and selenium. E. KORINTH. Mineralogy und Geol Inst., Jena. *Z. anorg. allgem. Chem.* **174**, 57–60(1928).—Crystn. of S from $CHCl_3$ soln. to which have been added rubber as a thickening agent and a few drops of benzonitrile, yielded several new forms. The least stable of these is the δ-modification, found to be identical with that described by Muthmann. It crystallizes as small, flat, hexagonal pyramids, nearly colorless, with angles between 119.5° and 121°. They are weakly birefringent and are extinguished parallel to one edge. In convergent light there is a lateral emergence of one optical axis of a biaxial crystal. This is easily transformed into the ζ-modification, crystg. as rhombic tablets, birefringent, colorless and extinguished parallel to the diagonal. The greater coeff. of refraction lies in the direction of the short diagonal. The crystals are biaxial, with one axis extinguished obliquely to the tablet face. The rhombus angles av. 64° 30′. Another form obtained is the η-modification, crystg. in hexagonal tablets with unequal angles. Those on the long edge vary between 122° 45′ and 122° 12′, while the others vary between 114° and 115° 36′. These crystals are only faintly colored, are birefringent and extinguished parallel to the long edge. These modifications of S are arranged as follows in the order of increasing stability: ϑ-tetragonal ⟶ δ-monoclinic ⟶ η-monoclinic ⟶ ζ-monoclinic ⟶ γ-monoclinic ⟶ β-monoclinic ⟶ α-rhombic. If a soln. of red amorphous Se in CS_2 is evapd., small hexagonal crystals sep. (about 50μ in size) which are yellow to reddish brown, transparent, birefringent, with extinction direction parallel to the longer side of the hexagon. They are monoclinic and are found to be isomorphous with the η-modification of S. If these crystals are added to a soln. of S, S is deposited on the Se crystals leading to a layer crystal of isomorphous S and Se. If only a little Se soln. is added to a S soln. such as described above, the η-modification of S is formed almost exclusively; examn. of the S crystals under high magnification, however, reveals the presence of tiny Se particles in the S crystals, demonstrating the conditioning effect of Se upon the crystal form of S. H. STOERTZ

The specific gravity of glycerol. L. W. BOSART AND A. W. SNODDY. *Seifensieder-Ztg.* **55**, 242(1928).—A correction to Prager's article (*C. A.* **22**, 1865) in which he says that the actual glycerol content is usually 0.2% lower than Gerlach's table shows that the Bosart-Snoddy table is throughout higher than Gerlach's. B. and S. show by an example that their values are usually somewhat lower than Gerlach's and that the latter's table is hardly accurate today. P. ESCHER

The reaction of liquids. L. W. HAASE. *Kl. Mitt. Ver. Wasserversorg. Abwässerbeseitig.* **3**, 281–98; *Chem. Zentr.* **1927**, II, 2328.—A discussion of subjective (chiefly optical) and objective (elec.) methods for the practical detn. of the reaction of liquids. The elec. methods have outstanding advantages. C. C. DAVIS

Theory of the extinguishing collisions between the dissolved molecules in viscous solutions. M. Leontovich. *Z. Physik* **50,** 58–63(1928); cf. *C. A.* **22,** 4375.—By a more rigorous treatment than that of Vavilov, an exact formula is worked out for i. This is $i = [{}^1/_{24}NcD\sigma][1 + (2D/v\sigma)]$, where N is the no. of mols. per cc., D the diffusion coeff., and σ the radius of the solute mol. G. M. Evans

New binary azeotropes. VI. Maurice Lecat. *Ann. soc. sci. Bruxelles* **47B,** I, 63–71; *Chem. Zentr.* 1927, II, 904–5; cf. *C. A.* **22,** 1712, 2722.—A continuation of the previous investigations of 142 systems. Of these, 52 formed pos. and 4 formed neg. azeotropes, 42 formed eutectics (water with 36 esters and 6 ethers) and the rest were not azeotropic. The following are to be emphasized: *Me borate,* m. 68.75°, forms an azeotrope with *MeOH,* b. 55–6°, which has been mistaken for Me borate; it further forms azeotropes with *n-hexane, isobutyl chloride, propyl bromide* and *acetone.* The b. ps. of various mixts. and their components are given as follows: 59% *acetone* (56.35°)—*n*-hexane (68.95°) = 49.8°; 88.5% acetone—CCl_4 (76.75°) = 56.28; 48% acetone—*methyl acetate* (56.25°) = 55.7°; 87% acetone—*chloromethyl ether* (59.15°) = 56.1°. CS_2 forms azeotropes with chloromethyl ether, *tert-butyl chloride, propyl chloride, ethylidene chloride* and *isopentene.* About 85% Me_2S (37.3°)—MeOH (64.7°) = 34°; 44% Et_2S (92.2°)—*EtOH* = 72.6°; 68% *furfurole* (161.45°)—*cymene* (176.7°) = 157.8°; 8% *glycol* (197.4°)—*bromoform* (149.3°) = 146.5°; *sec-octanol* (179°)—*benzyl chloride* (179.3°) = 176.5°; 90% *prim. n-octanol* (195.15°)—*benzal chloride* (205.15°) = 194.5°; 6% EtOH—propyl chloride (46.65°) = 45°; 30% acetone—ethylidene chloride (57.25°) = 57.55°. When a few drops of diethylamine are added to about 20 cc. CS_2 a violent reaction ensues with the formation of colorless crystals, m. 78°, with an odor of mustard oil. The nature of this product has not been detd. J. S. Reichert

Crystalline structure of benzene. E. Gordon Cox. Davy Faraday Research Lab. *Nature* **122,** 401(1928).—X-ray rotation method upon single crystals shows unit cell of benzene crystal to be simple orthorhombic, and to contain 4 mols. a = 7.44 A. U., b = 9.65 A. U., c = 6.81 A. U. at −22°. Space group is Q_h^{16} (orthorhombic bipyramidal). In *the crystal* the mol. has a center but no plane of symmetry. A. P. S.

Structure of thin films. XI. Oxygenated derivatives of benzene. N. K. Adam. *Proc. Roy. Soc.* (London) **A119,** 628–44(1928); cf. *C. A.* **22,** 1713.—Although many alkyl, acyl and ether derivs. of resorcinols and phloroglucinols have been examd. with a view to measurement of the cross section of the benzene ring, none has been found exactly suitable. The attraction of multiple hydroxyl groups for neighboring mols. outweighs their attraction for water and most of such rings stand upright. Only compds. with a resorcinol group at each end of a long carbon chain, and *humulone,* having three chains on the ring, could be said to lie flat, and in these cases the size and shape of the mol. prevented measurements of the ring itself. **XII. Cholesterol and its effect in admixture with other substances.** N. K. Adam and G. Jessop. *Ibid* 473–82.—Cholesterol and some simple derivs. form condensed surface films and condense films of substances which normally form liquid expanded films, though gaseous films are not completely condensed. As there is no detectable attraction by the cholesterol mols., and as some other large mols. partially share the condensing property, it is probably due to mechanical obstruction by the large mols. of the oscillations of the smaller ones. G. M. Evans

Glass. II. The transition between the glassy and liquid states in the case of glucose. George S. Parks, Hugh M. Huffman and Francis R. Cattoir. Stanford Univ. *J. Phys. Chem.* **32,** 1366–79(1928); cf. *C. A.* **22,** 1259–60.—A clear glass made by cooling melted cryst. glucose softens at 40° and becomes a viscous liquid at 60°. The sp. heat of this material increases 62% between 275° and 287° K. and has been measured between 90° and 340° K. The coeff. of thermal expansion increases 200% over the range 293–303° K. and has been measured from 262° to 348° K. The n shows a decided change from 20° to 30° and has been measured within the interval 7–77°. Aside from these irregularities the slopes of the curves are smooth. Theoretical discussion is reserved for a later communication. W. T. Richards

Adhesion of mercury to glass. W. C. Baker. *Science* **67,** 74–6(1928); *Science Abstracts* **31A,** 329.—The adhesion of Hg to glass was measured by means of a planoconvex lens suspended from the arm of a balance. The lens was lowered into a quantity of Hg, kept at const. level, and the diam. of the circle of contact was measured by a microscope and micrometer scale, and from this measurement the height of the apex of the meniscus above the pool of Hg was calcd. Measurements made with different circles of contact and with different lenses all led to the magnitudes to be expected from the known consts. of Hg. H. G.

Measuring with approximation the absolute size of pores. M. A. RABINOVICH AND N. S. FORTUNATOV. Kiev Polytech. Inst. *J. Chem. Ind.* (Moscow) **5**, 689–94 (1928).—The porosity of technical materials is usually characterized as *relative vol. of pores; viz.*, the ratio of the total vol. of the pores to the total vol. of the body. The relative vol. of pores reveals nothing about the real size of the pores. Yet, for the technological characterization of materials, the knowledge of the *abs. size of pores* would be valuable. *E. g.*, if the porous substance is a carrier (bearer) of great surfaces, it is by no means indifferent what the abs. size of pores is; the "*specific surface*" of the substance is the greater the smaller the pores, the porosity remaining const. Again, the *mechanical strength* of the materials certainly depends on the ratio between the av. size of the pores and their no. in a unit of vol. Finally, the abs. size of pores undoubtedly has an interest in the characterization of *diaphragms* in electrochem. processes and in many other cases. Considering the structure of porous bodies as a system of communicating capillary cylinders, R. and F. proceeded to det. the av. radii of the pores for various parts of vol. porosity; their method was based on the investigations of Zsigmondy (*C. A.* **11**, 2302), Anderson (*C. A.* **8**, 3141) and W. Bachmann who calcd. the dimensions of capillary pores of gels from the data obtained by detg. vapor pressures in the processes of hydration and dehydration of gels. Minkovskii's equation was modified thus: $r = K/(\log P_0 - \log P_1)$, where K is a const., P_0 vapor pressure over the flat surface and P_1 vapor pressure over the meniscus in the capillary pore, and it was assumed that $P_0 - P_1$ is not less than 0.05 mm. The radius to be measured is the greater the greater the const. K, which, in turn, increases with the decrease of temp., the values of K were detd. for 3 different temps. The app. used by R. and F. is described in detail and a drawing of it is given. Tables are given which contain all the data obtained in the detns. of Ural pine charcoal, Ural birch charcoal, activated charcoal, an American graphite electrode, a German graphite electrode, kaolin ignited at 900°, hard porcelain ignited at 1410°. In the order of decreasing relative vol. of pores the charcoals ranged themselves thus: birch charcoal, pine charcoal, activated charcoal; yet the porosity detns. show that activated charcoal is really the most porous of the 3, birch charcoal second and pine charcoal third. Parallels were also drawn between the 2 graphites and between the kaolin and the porcelain. In connection with the above expts. attention is drawn to the following analogy. Von Bemmeln and Bachmann have shown that the greater the age, and consequently the surface, of a gel, the less the vapor pressure beginning with which the irreversible processes of hydration and dehydration take place (*hysteresis*). For old gels the range of hysteresis begins with high values for vapor pressure, the water content being low; the range of hysteresis is in that case very small, and sometimes practically nil. These expts. with detns. of vapor pressures show that, for ignited porcelain, the hysteresis begins higher than for kaolin, and the range of the second is far greater than that of the former. The process of ignition at high temp. evidently leads to the same *changes in the structure* of the porous material as those which were observed in the process of aging of gels. BERNARD NELSON

Displacement of liquids in capillaries. J. L. SHERESHEFSKY. Mellon Inst. Pittsburgh. *Nature* **122**, 312(1928).—If one places in a capillary glass tube drops of 2 immiscible liquids, end to end, so as to form a liquid-liquid interface, the continuous bubble made by the 2 liquids will move in the direction of the liquid with greater surface tension. By raising the end of the tube toward which the bubble is moving to a certain height above the horizontal, equil. is produced and the bubble becomes stationary. If a capillary be so constructed that its ends are joined to tubes of a large cross-section where capillarity is not displayed, and if the ends of the liquid column extend into these tubes, then the liquid-liquid interface which is in the capillary will move in the direction of the liquid of smaller surface tension. This phenomenon may be used in measuring interfacial tension, angles of contact and adhesion tension of liquids against glass. R. J. HAVIGHURST

Surface tension of non-aqueous salt solutions. P. P. KOSAKEVICH. *Z. physik. Chem.* **133**, 1–14(1928).—By means of the capillary-rise method, the surface tensions of a large no. of non-aq. salt solns. have been measured, the solvents including aliphatic alcs., acids and ketones, glycerol, pyridine and furfuraldehyde. The surface tension of the pure solvents is raised by the addn. of salts. For concd. solns. the relation between the surface tension (γ) and salt concn. (C) is linear. For more dil. solns., 3 types of $\Delta\gamma$-C curves are found: (1) concave to the C-axis (chiefly Et and Pr alcs.); (2) convex to the C-axis (MeOH); (3) a straight line passing through the origin (chiefly non-alc. solvents and isoamyl alc.). The greatest neg. capillary activity is observed for salt solns. in MeOH; the value rapidly decreases with increase in the length of

the carbon chain in the homologous alc. series. This phenomenon may be connected with the greater degree of assocn. of salts in the higher alcs. In non-alc. solvents, the neg. capillary activity is found to vary but little. If the angle between the $\Delta\gamma$-C line and the C-axis is taken as a measure of the neg. capillary activity, the order of the alkali metals (in MeOH and EtOH) is the same as that in water, *viz.*, Li > Na > K. By direct comparison of the $\Delta\gamma$ values at equal concns. of the alkali iodides, however, different results are obtained according to the chosen concn., since the curves intersect one another. The order of the lyotropic series Cl > Br > I appears to be reversed in non-aq. solvents. B. C. A.

The rate of evaporation through surface films. RAYMOND BARTLETT AND THOS. C. POULTER. Ia. Wesleyan Col., Mt. Pleasant. *Proc. Iowa Acad. Sci.* **34,** 214–5 (1927).—The purpose was to study the influence of surface tension on the rate of evapn. of H_2O through surface films. The rate of evapn. of pure H_2O and H_2O from solns. of Ca and Na chlorides of concns. varying from 0 to nearly satn. were detd. These 2 solns. were selected because of the tendency of Ca to increase the surface tension and of Na to decrease the surface tension in H_2O solns. A mixt. of these salts was also studied because of the tendency of one to overcome the effects of the other on the surface tension. The 2 curves for the rate of evapn. of Ca and Na solns. were detd. and an increase in concn. caused a decrease in the rate of evapn. from each soln. The detns show a slight increase in the rate of evapn., thereby indicating that the rate of evapn. is influenced to a small degree by the surface tension of the liquid. W. G. G.

Surface actions in chemical phenomena. RENE DUBRISAY. *Bull. soc. chim.* **43,** 625–41(1928).—A review of surface phenomena, especially adsorption, with bibliography. LUCY K. PICKETT

A micro method for the determination of vapor pressure and water of hydration of solid compounds. FRANK E. E. GERMANN AND O. B. MUENCH. Colorado Univ. *J. Phys. Chem.* **32,** 1380–6(1928).—The method described consists in introducing solns of H_2SO_4 in dishes in the tightly closed case of a very sensitive assay balance, with sample painted from a satd. soln. of the salt to be investigated on a microscope cover glass. The loss or gain of wt. and the equil. wt. are then ascertained. An estimate of the vapor pressure of the salt may be thus obtained without loss of material and with the use of exceedingly small quantities. The vapor pressures so obtained may be related to heats of hydration through the Clausius-Clapeyron equation. W. T. RICHARDS

Vapor pressure of benzene-cyclohexane mixtures. N. N. NAGORNOV. *Ann. inst. anal. phys. chem. (Leningrad)* **3,** 562–83; *Chem Zentr.* **1927,** II, 2668.—The vapor pressures of C_6H_6-cyclohexane mixts. from 120 to 765 mm. of Hg were detd. by the dynamic method. The C_6H_6 had f. p. 5.43° and b_{760} 80.0° (thermometer in vapor), whereas the cyclohexane was less pure, with f. p. 6.43° and b_{760} 80.7°. When the pressure (P) is expressed in mm. of Hg (reduced to 0° and 45° latitude), the following expressions apply to pure C_6H_6: $\log P = 7.00380 - 1263.5/(226.44 + t)$; to pure cyclohexane: $\log P = 6.95541 - 1263.3/(229.36 + t)$; to a mixt. of 80.74% C_6H_6 + 19.26% cyclohexane (by wt.): $\log P = 6.90511 - 1214.5/(223.60 + t)$; to a mixt contg. 58.95% C_6H_6: $\log P = 7.05619 - 1305.8/(235.27 + t)$; to a mixt. contg 50.36% C_6H_6; $\log P = 6.96473 - 1253.3/(229.59 + t)$; to a mixt. contg. 40.60% C_6H_6: $\log P = 6.93436 - 1238.6/(228.01 + t)$; to a mixt. contg. 20.30% C_6H_6: $\log P = 6.87934 - 1213.8/(225.07 + t)$. From these data were calcd. by the method of Duhem-Margules the partial pressures of C_6H_6 and cyclohexane at various temps. The compn. of the vapor over the mixt. contg. 40% C_6H_6 changes hardly at all with change of temp The relative C_6H_6 content of the vapor over solns. rich in C_6H_6 increases with increase of temp., and the relative C_6H_6 content of the vapor over solns. poor in C_6H_6 diminishes with increase of temp. The *heats of vaporization* of the mixts. and of the components when evapd. from the mixts. were also calcd. The heats of vaporization of the pure substances were somewhat too great. Mixing C_6H_6 with cyclohexane is endothermic, and the heat tone of the mixing is —166 cal. (20°) per 0.5 mol. The undecompd mixt. b_{760} 77.44°. C. C. DAVIS

• **The viscosity of mercury.** S. ERK. *Z. Physik* **47,** 886–94(1928).—Poiseuille's law, that the speed of a flowing stream relative to the boundary wall is zero at the boundary layer, is applied to Hg since it does not wet surfaces. Recently Tammann and J. Hinnuber (*C. A.* **22,** 707) using metal capillaries have obtained results differing by several hundred percent from the hitherto accepted values. The results of Warburg, Bénard, Koch, Schweidler, Fawsitt, Fenninger and Plüss are compared. Values are given for the viscosity of Hg from —20° to 340°. S. L. B. ETHERTON

The viscosity of glycogen and some dyestuffs and a relation between gelation and

double refraction. S. N. Banerji and N. R. Dhar. Allahabad, India. *Kolloid-Z.* **46**, 24–6(1928).—The viscosities at 30° of solns. of the following dyestuffs decrease when small quantities of electrolytes are added: ponceau red, Victoria blue BA, Victoria blue B, dianil blue B, Bordeaux B extra aniline brown, dianil orange G. The viscosity of glycogen in 5% soln. is greater than is usual for hydrophobic colloids. On aging the viscosities of glycogen soln. and of Bordeaux B extra increase very slightly. Solns. of the following dyestuffs exhibit double refraction on streaming: methyl orange, patent scarlet, imperial green, tropaeolin D, theonine, mercury sulfosalicylate, orange III, orange N. R II, aniline orange. Many of these dyestuffs form jellies. High viscosity, strong hydration, tendency to gelation and double refraction depend upon the non-spherical shape of the dispersed particles. F. L. Browne

The viscosity isotherm of binary mixtures. G. Tammann and M. Elizabeth Pillsbury. *Z. anorg. allgem. Chem.* **172**, 243–55(1928).—A comprehensive survey is given on the viscosity isotherms with varying compn. for 56 binary mixts. of org. compds. These mixts. are classified into 4 groups with reference to the shape of the viscosity isotherm, its displacement with temp., and the nature of the phase diagram. (1) A max. appears on the viscosity curve and the m. p. curve. (2) No max. occurs on the viscosity curve and on the phase diagram no compd. crystallizes from the binary liquid mixt. (3) A compd. crystallizes from the binary liquid mixt., but there is no max. (4) On the viscosity curve there is a pronounced max., but on the phase diagram no compd. crystallizes. A binary mixt. of acetophenone and $SbBr_3$ is an example of case (1). In case (2) belong the isomorphous substances which form an interrupted series of mixed crystals, *e. g.*, p-$C_6H_4Br_2$-p-$C_6H_4Cl_2$, p-$C_6H_4Br_2$-p-C_6H_4BrCl, and p-$C_6H_4Cl_2$-p-C_6H_4BrCl, and also the substances which form a eutetic. Six examples of the third case and seven of the fourth case are known. A thorough treatment of the data on MeOH and water at different temps. is given. W. J. Sweeney

Observations on viscosity theories. P. C. van der Willigen. *Kolloid Z.* **46**, No. 1, 55–7(1928).—Crit. observations regarding the work and theories of K. C. Sen, N. R. Dhar and coworkers (cf. *C. A.* **20**, 1158, 3113; **21**, 1044, 3515; **22**, 2094), who consider the charge induced by adsorbed electrolyte to affect the viscosity of the colloid directly. These views are considered incorrect because (1) in the presence of large concn. of electrolyte other phenomena play a role, and (2) in the presence of small concn. of electrolyte, the assumptions are neither experimentally nor theoretically proved L. F. Marek

The effect of temperature on the viscosity of neon. R. S. Edwards. *Proc. Roy. Soc.* (London) **A119**, 578–90(1928).—The ratios of the viscosities of Ne at various temps. between —78.4° and 444.5° have been detd. by a const.-vol. method. The values for $\eta \times 10^4$ in c. g. s. units at various temps. are: —78.4°, 2.367; 15.0°, 3.076; 100.0°, 3.656; 184.4°, 4.177; 302.0°, 4.901; 444.5°, 5.584. An accuracy of 0.2% is claimed for these values. The formulas of Lennard-Jones and Sutherland are tested by these figures, neither showing any decided superiority. W. T. R.

The free path of molecules and the coefficients of internal friction in fluids. N. Gerasimov. *Physik. Z.* **29**, 575–84(1928).—A mathematical and theoretical paper. R. L. Hershey

The adsorption of hydrogen, ethylene, acetylene and ethane by stannous oxide. J. N Pearce and Sylvia M. Goergen Univ. of Iowa. *J. Phys. Chem.* **32**, 1423–33(1928).—The adsorption isotherms of H_2, C_2H_2, C_2H_4 and C_2H_6 on a hydrated SnO were detd. at 0°, 78.5°, and 100°. The adsorption of H_2 was found to be very small for all temps. That of the hydrocarbons is larger and decreases rapidly with rise in temp. The relative amts. of the gases adsorbed are shown by the following data given at 78.5° and at 75 cm. pressure: Vol. of gas adsorbed by 10 g. of the oxide, for H_2, 0.27; C_2H_2, 254, C_2H_4, 1.76; C_2H_6, 2.13. The oxide is reduced by H_2 at 183°. On the other hand C_2H_2 is polymerized as low as 100°. Hydrogenation of C_2H_4 was found at 100° when a mixt. of the 2 gases contg. a relatively large amt. of H_2 was in contact with the oxide. This indicates that the adsorption of H_2 is necessary before the reaction can take place. H. F. Johnstone

The adsorption of vapors on an amalgamated platinum surface. John Wm. Smith. Univ. College, London. *J. Chem. Soc.* **1928**, 2045–51; cf. McHaffie and Lenher, *C. A.* **19**, 3188.—The adsorption of the vapors of H_2O and C_6H_6 on an amalgamated Pt surface was measured at pressures near the satn. values and at temps. from 25° to 40°. The amalgamated surface was produced by allowing a Na amalgam to stand in the Pt vessel overnight, then washing the vessel with dry Hg and finally removing the last traces of Na with H_2O. Such a surface was quite permanent in the vapors studied but not in the lab. atm. Both vapors showed definitely the existence

of multimol. adsorbed films. The thickness of the H_2O film varied from 1 to 30 mol. and that of C_6H_6 from 1 to 150 according to the temp. and pressure. In the amalgamated vessel the vapor pressures of the liquids were always slightly lower than those under normal conditions. H. F. JOHNSTONE

Adsorption of mixtures of easily condensable gases. SIMON KLOSKY AND LEO P. L. WOO. Catholic Univ. *J. Phys. Chem.* **32**, 1387–95(1928).—Adsorption isotherms of C_4H_{10} at 0° and 25°, and of CH_3Cl at 25°, 35° and 45° on a titania gel were detd. by a dynamic method similar to that of Patrick and Opdyke (*C. A.* **19**, 2290). In the same way the adsorption of mixts. of SO_2 and CH_3Cl and SO_2 and C_4H_{10} by titania gel was measured at 25° and 35°. It was found that the equation:

$$\frac{N_0 - N}{N_0} \Big/ \frac{N_0' - N'}{N_0'} = \frac{M_2\eta_2}{M_1\eta_1}$$

shows a good agreement with the measured results. Here N and N' represent, resp., the no. of mols. of the 2 components of the gases adsorbed per g. of gel from the mixts. N_0 and N_0', the corresponding amts. adsorbed from the gas-air mixts., M_1 and M_2 the mol. wts. and η_1 and η_2 the viscosities of the gases. In other words, the relative adsorption lowering of one gas due to the pressure of the other is approx. inversely proportional to the product of the mol. wt. into the viscosity. The av. deviation is about 3%. The formula holds equally well for the results obtained by Richardson and Woodhouse for the adsorption of mixts. of CO_2 and N_2O on charcoal (cf. *C. A.* **18**, 187). H. F. JOHNSTONE

The existence of the Volmer adsorption film. FR. MOLL. I. G., Hauptlaboratorium, Ludwigshafen a. Rh. *Z. physik. Chem.* **136**, 183–5(1928); cf. *C. A.* **20**, 1935.—An improvement of Volmer's method, when applied to phthalic anhydride, coumarin and $(C_6H_5)_2CH_2$, showed the presence of adsorption films on crystals of these substances. This method gave negative results with paraffin and cetyl alc. The method is such, however, that the negative results do not prove the absence of the adsorption film. A new method involving the use of interference colors observed through a polarization microscope proved that adsorbed benzophenone and salol mols. diffuse through a glass plate. R. L. DODGE

The reversal of Traube's rule of adsorption. HARRY N. HOLMES AND J. B. McKELVEY. Oberlin College. *J. Phys. Chem.* **32**, 1522–3(1928).—Freundlich showed that C, a non-polar solid, adsorbs from aq. soln. the higher members of a homologous series of fatty acids (butyric, propionic, acetic and formic acids) more strongly than the lower members, as would be expected from Traube's rule that the higher members lower surface tension to a greater degree. It is now pointed out that the conditions should be reversed when a polar solid adsorbs the acids from soln. in a non-polar liquid and it is found exptly. that SiO_2 adsorbs the acids from soln. in toluene in the order caprylic < butyric < propionic < acetic. F. L. BROWNE

Adsorption anomalies. WOLFGANG OSTWALD. *Kolloid Z.* **43**, 268–76(1927).—From a consideration of published data it is shown that adsorption anomalies occur both for very small and very large amts. of the adsorbent. The relative adsorption decreases for small quantities of the adsorbent and has a max. value for a critical amt of solid phase. When a large excess of the adsorbent is used, the relative adsorption again falls, but later passes through a min. and begins to rise again. The behavior is explained as being due to the dispersion of some of the adsorbent, so increasing the surface; with very small quantities of adsorbent, the adsorption causes the coagulation of this dispersed material, corresponding with the fall in the relative adsorption. The anomaly in the region of large amts. of adsorbent is explained as a normal function of the curve connecting x/m with m, where x is the amt. of adsorbed material and m the amt. of adsorbent. B. C. A.

Adsorption of gases by chabasite. FRANZ SIMON. *Z. physik. Chem.* **132**, 456–9(1928).—The dehydration of chabasite which occurs on heating takes place in stages which show a stoichiometric relation between the wt. of the water and that of the dehydrated silicate. Measurements have been made of the adsorption of A and of N by the anhydrous substance at 90.2° abs. in order to det. whether similar relations obtain. The curves derived by plotting pressure against vol. of dissolved gas consist of a series of straight portions, with breaks at the points which correspond with the ratio 1 mol. gas:1 mol. chabasite. The slope of the curve at this point changes 75% for A and 85% for N. The curves exhibit breaks also at $^1/_2$ mol. of gas. The theoretical significance of these observations is discussed. B. C. A.

The adsorption of gases by graphitic carbon. II. X-ray investigation of the adsorbents. H. H. LOWRY AND R. M. BOZORTH. Bell Telephone Labs. *J. Phys.*

Chem. **32**, 1524–7(1928).—Ruff and collaborators (*C. A.* **22**, 546) concluded that graphite cannot be made to adsorb considerable quantities of gas and that only amorphous C has high adsorptive capacity. Data of Lowry and Morgan (*C. A.* **19**, 3398) show that C prepd. by the explosion of graphitic acid has $^1/_3$ to $^1/_4$ the adsorptive capacity of the best charcoal. It is shown here by x-ray investigation that this C is in fact graphitic in structure as was previously inferred by Burns and Hulett (*C. A.* **17**, 1564) from the agreement in its d. with the d. of graphite. The individual particles are found to be flakes approx. 50 atoms in diameter by 10 atoms in thickness. The method of prepn. makes it reasonable to suppose that the crystal lattices are broken up to a considerable extent, leaving the surface atoms highly unsatd. and that the lower adsorptive capacity of Ruff's graphite was due to the fact that it was merely mechanically finely divided and not made up largely of broken crystals. In other words, to have high adsorptive capacity, a material must have not only high sp. surface, but highly unsatd. atoms at the surface. F. L. Browne

Heat of adsorption on charcoal of certain organic vapors. Lloyd McKinley and J. N. Pearce. State U. of Ia. *Proc. Iowa Acad. Sci.* **34**, 216(1927).—Previous work (*C. A.* **21**, 1575) on the heat of adsorption has been carried out by the use of the ice calorimeter adapted only to liquids of appreciable vapor pressure at 0°, and affording no investigation of the effect of temp. upon the heat of adsorption. A method for studying the heat of adsorption at different temps. by employing a sensitive thermocouple in a calorimeter system consisting of a known wt. oil of low sp. heat in a Dewar flask is mentioned. With this arrangement it was found that a change of 1 microvolt in the thermocouple reading corresponds to 0.06 cal. per g. of charcoal. W. G. G.

The adsorption of certain vapors by charcoal at various temperatures up to and above their critical temperatures. J. N. Pearce and C. M. Knudson. *Proc. Iowa Acad. Sci.* **34**, 197–212(1927).—The adsorption isotherms have been detd. at several temps. for each of the vapors, EtOH, MeOH, H_2O, NH_3 and CH_3NH_2. The adsorbent was a uniform sample of a specially prepd., acid-washed, ash-free, steam-activated charcoal. The isotherms for H_2O vapor indicate that a different type of phenomenon is involved here than in the case of the other vapors. The retention of the H_2O vapor by the charcoal is probably due to mere capillary action rather than to the surface forces of adsorption. The Freundlich isotherm relation has been shown to apply, except near satn. to the 2 alcs. and to NH_3, but not to H_2O and CH_3NH_2. The Kayser equation, as used by Gaddes, is applicable only within a narrow range, while the equation of Schmidt and Hinteler, and that of Williams do not seem to apply in any range. It is found that neither the Homfray nor the Freundlich equations for the isobars express satisfactorily the relations shown by the isobars. The Freundlich isostere equation, for the special case where $\xi = 0$, applies with considerable accuracy, except at high temps. The Ramsay and Young law is not applicable to these vapors. The law of corresponding states holds approx., except for H_2O and CH_3NH_2. W. G. Gaessler

Adsorption by decolorizing earth in nonaqueous solutions. Bernhard Neumann and Salomon Kober. *Kolloidchem. Beihefte* **27**, 1–44(1928).—Decolorizing earths show greater ability to decolorize natural soy oil if they are heated to about 600° before use. This treatment lowers the adsorptive power of the material for dyes in paraffin oil. It is shown that no chem. decompn. results from the heat treatment in question so the change in adsorptive power must be caused by a change in some phys. property such as porosity. The colored matter in natural soy oil is colloidal while the dye in the paraffin-oil soln. was crystalloidal. It is shown that in general heating a decolorizing earth above the temp. necessary to remove adsorbed water increases its adsorptive ability for colloids but lowers it for crystalloids. J. G. McNally

Adsorption processes in flotation. K. Kellermann and E. Peetz. *Kolloid-Z.* **44**, 296–308(1928).—The adsorption of caprylic (octoic) acid by quartz and by galena was studied by measurements of the *n*, elec. potential, elec. cond., and surface tension. Examn. of the system quartz–octoic acid showed that, although quartz does not act as an adsorbent, a portion of it goes into colloidal soln. under the peptizing influence of octoic acid, and in this state it acts as an adsorbent. Galena is attacked by octoic acid, and the measurements were carried out in presence of a soln. satd. with respect to Pb octoate. Galena adsorbs octoic acid well, although the dried material does so poorly. The consts. of the adsorption isotherms have been calcd. from the exptl. data, and also the mol. thickness of the adsorption layers. Under the exptl. conditions, galena is readily floated, while quartz is not; the parallel between flotation and adsorption is discussed in regard to flotation practice. B. C. A.

Adsorption in mixtures of solvents. E. Angelescu and V. N. Comănescu. *Kol-*

loid-Z. **44,** 288–96(1928).—Measurements have been made of the adsorption of picric acid by animal charcoal in benzene, Et alc., and acetone and in various mixts. of the following pairs of liquids: Et alc.-chloroform, benzene-Et ether, Et alcohol-Et ether, acetone-benzene, Et alc.-benzene, acetone-chloroform, acetone-Et alc. and acetone-water. The concn. of the picric acid was varied between 2 and 8%. The results show that the ordinary adsorption equation $a = kc^{1/n}$ is applicable to mixts. of solvents. The values of the exponents vary between narrow limits, and the const. k is inversely proportional to the nth root of the soly. l of picric acid in the solvent or mixt. of solvents. The product $kl^{1/n}$ is a measure of the affinity between animal charcoal and picric acid and can be used as a measure of the adsorptive power of a specimen of charcoal. Exceptions to these generalizations were found in the mixts. of acetone with water or Et alc. contg. a high percentage of acetone. B. C. A.

Adsorption phenomena in solutions. XI. NIKOLAI SHILOV AND KONSTANTIN CHMUTOV. *Z. physik. Chem.* **133,** 188–201(1928).—C purified by ignition in air differs from that prepd. by treating with H at a high temp. in that it always retains a film of adsorbed CO_2. The hydrolysis of both weak and strong electrolytes brought about by adsorption on C has been followed by p_H measurements, and in agreement with observations of the related phenomena of cataphoresis and electro-osmosis. it is found that with a neg. adsorbent the anions are adsorbed before the cations. Two stages in the process of adsorption can thus be defined: in the first the charge on the adsorbent increases by reason of the adsorption of ions bearing charges of the same sign as that of the adsorbent; in the second ions of the opposite sign are adsorbed and this corresponds with mol. adsorption. This theory is in accordance with the observation that strong electrolytes undergo hydrolysis when in contact with an adsorbent, whereas weak electrolytes merely experience mol. adsorption. B. C. A.

Adsorption and solution phenomena encountered in precipitations. FREDERICK R. BALCAR WITH GEBHARD STEGEMAN. Pittsburgh Univ. *J. Phys. Chem.* **32,** 1411–21(1928).—When $BaSO_4$ is pptd. in solns. contg. $ThCl_4$, the Th ion is removed from the soln. in large quantities (cf. Kammer and Silvermann, *C. A.* **20,** 9). With continued agitation, however, the Th reënters the soln. The concn. of Th ions has a marked effect on the size of the $BaSO_4$ particles. The solubilities of $BaSO_4$ and of $PbSO_4$ in solns. of $ThCl_4$ are considerably larger than those in H_2O and were found to follow the Freundlich isotherm: $S = KC^n$, where C is the concn. of $ThCl_4$ and K and n are consts. The values of $-\log S/S_0$ (S_0 = the soly. in H_2O and S the soly. in the presence of $ThCl_4$), which, according to the theory of Debye and Hückel, should equal the log of the activity coeffs.. are of the order of 100 times too large. While the equil. relations between Ba^{++} and SO_4^{--} ions in solns. of $ThCl_4$ do not obey the usual mass-action law they indicate that there is a sp. interaction of the ions rather than any complex ion formation. The adsorption of Th ions by $BaSO_4$ when the latter is pptd. in a $ThCl_4$ soln. does not follow the isotherm, $x/m = KC^n$, because of the changing values of C as the sulfate is pptd. The equation: $x/m = KC^F/\sqrt[3]{m}$, where F is a logarithmic function of m, is suggested to represent the results. H. F. JOHNSTONE

Adsorption and crystal form. CHARLES H. SAYLOR. *Fifth Colloid Symposium Monograph* 1927, pp. 49–54.—NaCl crystallizes from pure water in cubes, but in the presence of urea it gives octahedra or cubes with octahedron faces truncating the cube corners. In general, if a substance crystallizable in 2 forms, is allowed to crystallize first in the presence of a presumably strongly adsorbed cation, and then again in the presence of a presumably strongly adsorbed anion, one of these solns will show increased tendency to yield the less stable crystal form. If, *e. g.*, the less stable form appears in alk. solns., one can predict that all strongly adsorbed anions will tend to produce the same effect, and that strongly adsorbed cations will tend to counteract it. Preferential adsorption on certain crystal faces changes the rate of growth of such faces. Alc., by opposing the adsorption of anions, works against the urea and anion effect, detg. formation of cubic NaCl. "This new technic is absolutely general... works as well for strongly adsorbed cations as anions....applies equally well to melts... can be used with substances belonging to any crystal system. Although in any case an adsorbed material may throw the habit either way, a single key reaction makes it possible to predict the rest. The only condition is that some substance shall be adsorbed preferentially on one of the several possible crystal habits." $SbCl_3$ in NaCl solns. gives ions of H_3SbCl_6, which are so strongly adsorbed on the octahedron face as to lead to inclusions in rapidly grown NaCl octahedra. K alum ordinarily forms octahedra, but from weakly alk. solns. (K_2CO_3, borax) it gives cubes. Methylene blue forces $BaNO_3$ to form cubes (often with colored faces); H-ions act similarly Urea and OH-ions oppose the natural tendency of $Ba(NO_3)_2$ to form cube faces on its

octahedra. $NaNO_3$ crystd. in the presence of HNO_3, the H-ions being adsorbed on the prism faces, it produces long thin crystals; and, as expected, NaOH produces short stubby crystals. An octahedron face of NaCl, when rubbed against a cube face, developed a negative charge. Other substances will, no doubt, behave the same way. When there is no change in the underlying cryst. structure, the *habit* on which adsorption occurs is favored; but when there is a change of structure, the *modification* on which adsorption occurs is repressed. Excessively strong adsorption on a cryst. modification tends to peptize it and put each cryst. nucleus as it forms into colloidal soln., removing it as a starting point for crystal growth, so that supersatn. occurs for want of seed crystals. Thus quinoline yellow causes supersatn. of K_2SO_4; acid dyes cause several hundred % supersatn. in TlCl. On slowly adding, at 60°, 0.1 *M* K_2CO_3 soln. to a soln. contg. a small amt. of $Ca(OH)_2$ and an excess of KOH, only calcite appears. On adding 0.1 *M* $CaCl_2$ to a soln. contg. 50 g. K_2CO_3 in 700 cc. water, one gets principally μ $CaCO_3$ (hexagonal, optically positive, known also as *vaterite*), with a small amt. of aragonite and a trace of calcite. As the carbonate is decreased, aragonite begins to supplant the μ $CaCO_3$, and with still smaller amts. of carbonate, calcite dominates. "I therefore postulate that the carbonate—or more probably the bicarbonate—ion is adsorbed on the calcite, less on the aragonite, and least on the μ $CaCO_3$, that it peptizes the crystal nuclei of the forms on which it is most strongly adsorbed, and prevents their appearance in recognizable crystals." Similar results follow in melts; strong adsorption on a crystal nucleus enables metastable modifications to appear. JEROME ALEXANDER

Adsorption from solution by ash-free adsorbent charcoal. ELROY J. MILLER. *Fifth Colloid Symposium Monograph* 1927, pp. 55–80; cf. *C. A.* 22, 3079.—Expts. with ash-free activated sugar charcoal show: it adsorbs acids but not the inorg. bases; strong inorg. bases are negatively adsorbed; salts are hydrolytically adsorbed, this being exclusively the case with neutral salts of inorg. acids, *e. g.*, NaCl, K_2SO_4 only acid being adsorbed and the corresponding base remaining in soln.; the adsorption of salts of highly adsorbed organic acids, *e. g.*, Na benzoate or salicylate, is partly hydrolytic and partly mol. The charcoal being free from impurities, the adsorbed acids may be quantitatively removed and identified, and is equiv. to the base set free. All other *pure* charcoals, whatever their original source, behaved similarly; but if the purified charcoals were treated with chosen impurities, the adsorption anomalies of the literature could be reproduced. It appears that the charcoal acts like the org. liquid in the Langmuir-Harkins interfacial oriented adsorption theory. Introduction of amino acids or OH groups into org. acids invariably results in a decrease in adsorption. Closer accord with the Gibbs adsorption theorem is shown by pure than by unpurified charcoals. Mol orientation seems to be involved in the adsorption. Thus, with hydroxy- and aminobenzoic acids adsorption is greatest with the *o*-compds., less with the *p*-, and least with the *m*-compds. Chloro- and dichloroacetic acids are more strongly adsorbed than AcOH, while aminoacetic acid is not adsorbed at all; this indicates that some groups favor adsorption, while others oppose it. With butyric, valeric, and caproic acids, the iso forms are less adsorbed than the normal forms. NH_4OH is not adsorbed at all NMe_4OH is very slightly adsorbed, and NEt_4OH is adsorbed as strongly as the inorg. acids. Sulfosalicylic acid is adsorbed much less than benzoic, salicylic, or aminobenzoic acids. When adsorbed on charcoal, acids are incapable of inverting sugar, indicating the non-ionization of the acid. "It seems certain that adsorbed acids exist in direct mol. contact with the surface atoms of the charcoal." "The non-dissociation of the adsorbed electrolytes is of crit. importance for theories of electrokinetic potential." The H-ion is highly adsorbed, but many facts indicate that the OH-ion shows negative adsorption, which necessitates revision of the common explanation that charcoal is negatively charged in alk. soln., for obviously, the charge cannot be due to adsorption of OH-ions. By adsorption from buffer solns. it was shown that pure charcoal has no isoelec. point, and that the isoelec. point of blood charcoal is likewise fictitious. JEROME ALEXANDER

Some unsolved problems in the molecular-kinetic behavior of colloidal suspensions. ELMER O. KRAEMER. *Fifth Colloid Symposium Monograph* 1927, pp. 81–112.—"The purpose of this paper is to survey the evidence which may indicate the limits of validity of the simple kinetic theory (dealing with Brownian motion, sedimentation, etc.), to exam. the possible causes for departure from ideal relationships, and to consider particularly the extent to which the elec. charge or the vol. of colloidal particles may modify their behavior. In developing the theory of the Brownian motion in a gravitational field, Einstein, Smoluchowski, Debye, Schrödinger and their successors assume a uniform gravity drift, unmodified by the superimposed Brownian motion for particles suspended in a medium infinitely deep. In other words, after appropriate subtraction

of the drift due to gravity from the total motion, the remaining displacements are assumed to be identical with those to be expected in the absence of gravitational influence. This simple additivity relationship was assumed to be approx. true in practical cases during the first stages of sedimentation." Many other writers, *e. g.*, Ayres, Bancroft, Bayliss, Bradford, Burton, Holmes, Truog, explain the stability and absence of sedimentation in colloidal systems by supposing that a sufficiently vigorous Brownian motion overcomes or neutralizes the tendency to settle even in an infinitely deep dispersion, thus effecting stability. Following a crit. discussion of the work of Fletcher, Eyring, Millikan, Svedberg, Nordlund, Burton, Westgren, Brillouin, Iljin, Lorenz and Eitel, Porter, Costantin, Mendenhall, Barkas, and others, K. states: "These considerations lead to the conclusion that the questions concerning the validity of the ideal kinetic equations as a description of the behavior of suspensions, remain unanswered by recent studies of sedimentation. The problem of stability of such suspensions has the same status. It has not yet been proved that the forces which prevent collision and adherence of the particles, also give rise to the more or less uniform concentration commonly observed in these systems, even when dil. If these stabilizing forces were to operate with such long ranges as to prevent sedimentation under the influence of gravity, there is every reason to believe that the same forces would likewise reveal themselves in such phenomena as Brownian motion, diffusion, spontaneous fluctuations, as well as sedimentation. Until these various phenomena yield the same conclusions concerning the non-ideality in the kinetic behavior of suspensions, isolated cases of discrepancy between observations and theory may be suspected to be due to spurious effects of an external character." JEROME ALEXANDER

Investigation of adsorption on glasses and filtering media by the method of radioactive indicators. HERTA LANG. *Weiner Anz.* **1927**, 7–8; *Physik. Ber.* **8**, 766(1928).—The adsorption of Th B, Th C and Po on filtering media, dialyzing membranes, various kinds of glass, quartz and paraffin was measured and earlier work of Paneth and Godlewski substantiated and extended. In many glasses satn. was reached when only a small fraction of the surface was covered. Hard Jena glass adsorbs much less Po than soft glasses and is therefore to be preferred. G. L. CLARK

Extension of Dulong and Petit's law to gaseous compounds and mixtures. A. PRESS. *Phil. Mag.* [7], **5**, 832–4(1928).—From former thermodynamic studies (*C. A.* **22**, 533) P. derives the relation $2\alpha = (\gamma - 1) \times S \times M$; where α = a factor, γ = ratio of sp. heats, S = sp. heat, M = mol. wt. The constancy of the factor 2α is shown for a large no. of substances. GEORGE GLOCKLER

The physical properties of heterogeneous ternary mixtures. PAUL MONDAIN-MONVAL. *Compt. rend.* **187**, 444–7(1928).—M. does not agree with Brun (cf. *C. A.* **22**, 1090) that for the system EtOH, iso-AmOH, H_2O there is disturbance in the phys. properties near the crit. point in the homogeneous region. From a study of n he finds no distortion. E. G. VANDEN BOSCHE

Some physical properties of phenol in benzene. LLOYD E. SWEARINGEN. Oklahoma Univ. *J. Phys Chem.* **32**, 1346–53(1928).—The ds., viscosities and surface tensions of several PhOH-benzene solns. and the surface tensions of satd. solns. catechol, resorcinol, hydroquinone, pyrogallol and phloroglucinol in benzene have been measured at 25°. The apparent molal vol. of PhOH in benzene was calcd. and found practically const. over the entire range of concn. studied, thus indicating the existence of only ideal solns. The viscosity-compn. and surface tension-compn. curves for PhOH-benzene solns. both exhibit minima. These indicate, resp., that PhOH mols. are associated in the more concd. solns. and that there is an adsorption of benzene in the surface layer. The surface tension of satd. solns. of the di- and trihydroxybenzenes in benzene were all practically the same, 26.8–26.9 dynes. H. F. J.

The chemistry of clouds and dusts. I and II. H. REMY. *Chem.-Ztg.* **52**, 677–9, 698–9(1928).—If SO_3 be expelled from fuming H_2SO_4 by blowing air through it, the clouds pass through H_2O just as does NH_4Cl, but if concd. H_2SO_4 be used as an absorbent the clouds disappear instantly. If, however, a wash-bottle contg. H_2O be introduced in the train of app. after the concd. H_2SO_4, renewed clouds appear. They are therefore only rendered invisible by H_2SO_4—not completely absorbed. SO_3 from a contact plant is actually absorbed by concd. H_2SO_4; quant. expts. reported confirm this statement. KOH solns. absorb SO_3 even less satisfactorily than does H_2O. Expts. proved that all cloud-forming materials are taken up by their concd. solns. better than by dil. solns. A distinction must be made between dry clouds, as in SO_3 from a contact plant, and those that are moist, as in the SO_3 expelled from fuming H_2SO_4. The diam. of particles in moist clouds is in general above the upper limit of the diam. of colloid particles, while that of particles in dry clouds is below it, thus giving rise to the name

"colloid dusts" for the dry clouds. Tables and graphs show these characteristics for SO_3 and NH_4Cl in their action on H_2O, gas-mask C, filter paper, NH_4Cl solns. and $CaCl_2$ solns. It is pointed out that vapor pressure equil. at the surface of the particle does not play an essential part in detg. the absorptivity of a cloud in a given liquid. Investigations to det. the influence of elec. charges upon the absorptive properties of clouds showed that no such charge could be detected by observing the Tyndall effect, but with suitable electrometer the charges in clouds could be measured readily. These charges could not be looked upon as the cause of the stability of clouds, nor could the matter of completeness of wetting be demonstrated as a detg. factor in absorption. The dependence of absorptive power upon the size of the particles was established experimentally; filtered clouds were absorbed better by suitable liquids than were unfiltered clouds. The low mobility of cloud particles is the only explanation for their absorptivity. This explains also why SO_3 clouds can pass through KOH solns.—the SO_3 particles may never touch the viscous soln. Solns. of gelatin of 0.0, 0.1, 0 5 and 1.0% concn. showed similar effects, their absorptive power for SO_3 being 37.4, 29.5, 22.3 and 5.1%, resp. There is a crit. region of particle size that dets. its behavior; the lower the size of the particles the more do the clouds behave like gases, and the larger the size the more do they tend to settle out. The absorption of SO_3 in boiling H_2O is explained on the same basis of particle size and ultimate contact. The crit. region of particle size in the form of cloud or mist does not necessarily correspond with that of the colloid particles in aq. and other solns., for it really comes more nearly in the region of ordinary suspensions. The behavior of cloud particles is therefore related closely to the phenomena of colloids. The state of subdivision, as well as chem. compn., must be considered as very important. W. C. EBAUGH

Unity in the theory of colloids. H. R. KRUYT. *Fifth Colloid Symposium Monograph* **1928,** 7–18.—A crit. review. From the standpoint of the kinetic theory, it is immaterial whether a particle is mono- or polymolecular. True solns. represent a condition of equil.; colloidal solns. do not. Work in K.'s lab. has shown: Lyophylic sols are polymol.; their elec. charge is of the same type as that of suspensoids; but with the latter, it is the only stability factor, whereas with lyophylic particles, hydration is equally important. The importance of H-ion concn. has been greatly exaggerated. Brailsford Robertson, Wo. Pauli, Jacques Loeb, and Jacques Duclaux, among others, "treat protein solns. as molecularly or ionically dispersed systems. Although I differ absolutely from them, I can understand very well how they came to this viewpoint." JEROME ALEXANDER

The stability of emulsions, monomolecular and polymolecular films, thickness of the water film on salt solutions, and the spreading of liquids. WM. D. HARKINS (parts with J. W. MORGAN, NORVIL BEEMAN, B. GINSBERG and B. B. FREUD). *Fifth Colloid Symposium Monograph* **1928,** 19–48.—It was not found possible to form polymol. films of palmitic acid, or of substances contg. polar groups, *e. g.*, COOH, OH, NH_2, CO, or SH, etc. Polar groups in org. substances are not essential to spreading, for benzene, hexane, pentane and octane spread on pure water; but spreading occurs when the interfacial work of adhesion between the liquids exceeds the surface work of cohesion in the liquid. The only substances thus far found which will give polymol. films on water are: di-β-naphthylamine and symmetrical di-β-triphenylethyl. By using 40% solns. of $CaCl_2$ to increase the work of adhesion, polymol. films were obtained with phenanthrene, hexachlorobenzene, sym. di-β-triphenylethylurea, triphenylmethyl cyanide, 9,10-dibromoanthracene, di-β-naphthylamine, and α-bromonaphthalene; thickness of films varied from 110 to 400 A. U. Such films are weaker than monomol. films, but usually show, like the latter, on compression at high pressures, a linear relation between the compressive force and mol. area. They are very thin, the thickest being only about 0.1 the shortest wave length of visible light. Young's modulus for steel is about 12,000; for a monomol. film of stearic acid on water, it is 39 (less if on $CaCl_2$ soln.). Polymol. films of dibromoanthracene showed less than 2. If 2 substances form monomol. films, their mixts. do likewise. Mixts. of stearic acid and phenanthrene gave polymol. films, almost all of the latter being piled up on the under monomol. layer of stearic acid. The film strength equals or surpasses that of pure acid with 1 mol. phenanthrene to 2.58 acid, but decreases if much more of the former is present. A method was developed for detn. of the stability of emulsions, by detg. the distribution of size of droplets in the freshly prepd. emulsion and at intervals later. The stability may be expressed by the distribution curves themselves, or by the change of area per unit vol. of oil. With concd. emulsions, sufficient diln. must be made to prevent changes during test, and the size distribution detd. by a photographic optical method (Stamm, *C. A*. **19,** 2768), by a density method (Kraemer and Stamm, *C. A*.

19, 761), or by direct microscopic measurement (Finkle, Draper and Hildebrand, *C. A.* **18**, 607). Concd. octane emulsions made with 0.005 *N* Na or Cs oleate are unstable when fresh, the interfacial area decreasing rapidly; with the former soap from 25,500 sq. cm. per cc. octane to 14,600 in 3 days, and from 25,000 to 13,800 with the latter soap. Evidently the concn. of soap in the monomol. film increases rapidly. After 2 days the area per mol. of soap in the film was 61 sq. A. U. with 0.005 molar soaps, and 64 sq. A. U. with 0.01 *M* solns., indicating a moderately dil. monomol. layer. This is practically 3 times the area of oleic acid in concd monomol. films on water. Concd. emulsions were obtained with extremely dil. soap solns., but below 0 008 *M* the emulsions were too unstable to measure. Without emulsifying agents, no higher than 4% of oil can be emulsified in water. "However, with soap as an emulsifying agent, a highly concd. emulsion may be obtained by the formation of a *highly dil. monomol. film.* The film will produce such an emulsion even if it contains only about $^1/_5$ or $^1/_{10}$ the no. of mols. contained in a tightly packed monomol. film of soap. Such an emulsion is not stable, and a process occurs in which the distribution of sizes changes in such a way that the mean drop-size increases. This causes a decrease in area per mol., until this area becomes about that to be expected for an ordinary tightly packed monomol. film." To obviate optical errors, an image of a thin layer of emulsion was projected on a specially prepd. screen, by using an arc, a microscope giving $\times 61$, having 3-mm. apochromatic oil immersion objective of 1 40 N. A., and a $\times 25$ compensating ocular, with an aplanic condenser of 1.40 N. A. The screen was ruled with lines about 0.7 mm. apart, corresponding to 1μ. As cell was used a special hemocytometer 0.1 mm. deep, with a very thin cover glass. Curves are given showing the distribution of droplet sizes in stanolax (a heavy paraffin oil) and octane emulsions, 4019 and 2420 droplets, resp., being measured. Na, K, and Cs oleates gave parallel results, indicating that the at. vol. of the cation is not determinative. Na stearate, elaidate, and cerotate showed like results, but the gelling of the last made accurate observation difficult. With K chaulmoograte (0.1 *M*) the no. of visible droplets between 0 and 1μ was double that between 1 and 2μ, whereas with the other anions the contrary was true. Chaulmoograte emulsions aged more in a few hrs than oleate emulsions did in a year. Water-in-oil emulsions made by dissolving Mg and Al oleates in stanolax, and then beating in water, showed counts similar to the oil-in-water emulsions. When the oil and pure water were mixed, about 10 times as many droplets of oil appeared in the water, as of water in the oil, after 2 hours' standing. Although stanolax has 400 times the viscosity of octane, the peak in the distribution curve lies about 1.5μ in each case. Benzene shows the peak at about 0.5μ, indicating that other factors than viscosity dominate Sometimes the motor-driven egg beater failed to effect emulsification speedily; but when a foam appeared, emulsion at once formed. The peak was changed but slightly by different procedures. Slight excess of NaOH or of oleic acid produced no material change; but 0.1 *M* base considerably increased the no. of smaller drops. Stability is usually lessened by addn. of 0.1 *M* oleic acid to the org. phase, or of 0.1 *M* NaOH or NaCl to the aq. phase before emulsification. Exceedingly dil. emulsions made without stabilizing agents exhibit the usual type of size distribution. A graph is given showing thickness of water films on salt solns. That on NaCl, extrapolated to zero concn is 3.8 A. U. Contrary to literature statements, NaCl is negatively adsorbed at a water-benzene interface, where, with concd. salt solns., the water film equals that between salt soln. and vapor. With dil. solns., however, the former is slightly thicker Calcns. indicate that on aq. solns. of org. solutes (*e. g.*, MeOH or EtOH), the surface film is somewhat thicker than monomol. in more concd. solns. A modified form of Donnan's app. is illustrated and described. "With CS_2 as well as other non-spreading liquids Antonow's relation, so generally cited as entirely correct, is very far from true Preliminary illustrations are given of the form of hanging and falling drops. A table is given showing the no. of regions, interfaces, and phases for a few systems of zero degrees of freedom. JEROME ALEXANDER

Colloidal platinum. IV. The existence of hexahydroxyplatinic acid in colloidal platinum solutions. STUART W. PENNYCUIK. Univ. of Adelaide, S. Australia *J. Chem. Soc.* **1928**, 2108–17; cf. *C. A.* **22**, 2305.—Colloidal Pt solns. carefully prepd. by the Bredig method contained a free acid, $H_2Pt(OH)_6$, hexahydroxyplatinic acid, after the Pt was coagulated. This acid, first prepd. by Wöhler and by Belluci, is a strong dibasic acid, more stable than chloroplatinic acid. The presence of the acid was shown by coagulating the Pt by freezing and then titrating the clear soln. Dehydrated forms of this acid, *e. g.*, $H_2PtO(OH)_4$ or $PtO_2 \cdot 2H_2O$ may be present with the acid. The hexahydroxy acid is part of the structure of the colloid particle, as shown by the fact that when the fresh sol is centrifuged, the cond. on boiling increases from about

6 to 25 gemmhos. This increase in cond. must be due to the strong acids sepd. from the colloid particle by boiling. This acid is not formed by oxidation for a max. cond. of about 39 gemmhos is reached upon boiling for 8 hrs. followed by coagulation. The same results are obtained if an atm. of N is used. The stability of the colloid may be due to the ionization of the surface acid. Coagulation of Pt sols by bases is considered with reference to neutralization of the surface acid. A. J. CURRIER

Collected reviews on colloidal technic. V. Electrical insulating materials. HANS STÄGER. *Kolloid Z.* **46**, 60–6(1928).—The dielec. strength phenomena are self-evidently associated with capillary chem. changes such as changes in degree of dispersion and in the colloidal state as well as with pure elec. processes. Aerosols bear an important part in the dielec. strength of air. Dissolved gases, dissolved or dispersed water, dispersed solids, oxidation products, etc., influence the use of oils for insulation. The prepn. of oils may include filter pressing, or centrifuging to remove colloidal matter. With solid materials the fibrous structure as well as the hydrophilic qualities must be considered. This is especially true in the manuf. of insulating paper where a wax is used for impregnating. The colloid chem. aspects of synthetic resins should be understood, as they are important insulating materials. L. F. MAREK

Cataphoresis in copper oxide sols. The application of Debye and Hückel's theory of electrolytic conduction to colloid particles. H. H. PAINE. Univ. Witwatersrand, Johannesburg, S. Africa. *Trans. Faraday Soc.* **24**, 412–29(1928).—The mobility of the particles of CuO sols and similar sols to which electrolytes have been added is measured by the transportation method. The app. used consists of an inverted U tube to the bend of which a tube is fused. A Pt electrode is placed upon each limb of the tube and the 2 limbs are inverted in 2 sep. flasks. This app. possesses several advantages over other types. Results obtained by the addn. of electrolytes, KCl, K_2SO_4 and $K_4Fe(CN)_6$, to CuO sols are: (1) The first addns. of salt reduce the velocity of the particles more than later addns. do. (2) The greater the valency of the ion carrying a charge opposite in sign to that carried by the particles, the greater the effect in reducing the velocity of the particles. (3) The decrease in mobility from the value at zero concn. is directly proportional to the square root of the concn. of the electrolyte. The similarity of the Helmholtz double layer and the Debye-Hückel "structure" of the ion is discussed. The elec. conditions are the same in the ion as in the colloid particle. The central charge on the latter, however, is much greater than with the ion and the "ionic atmosphere" does not approach as closely to the center of the system. As the charge of the electrolyte increases, the charge on the particle apparently remains unchanged and the "ionic atmosphere" contracts. Some indications are given of the effect of the size of the central particle on the diminution of mobility produced by electrolytes. A. J. CURRIER

Cataphoresis and the electrical neutralization of colloidal material. SANTE MATTSON. N. Jersey Agr. Expt. Sta. *J. Phys. Chem.* **32**, 1532–52(1928).—An ultramicroscopic observation cell for rapid detn. of cataphoresis of individual colloid particles is described. Essentially it is the cell usually employed with the slit ultramicroscope except that it is 22.3 cm. long and ends in larger chambers contg. electrodes. The optical system for illumination is that of the slit ultramicroscope. The time required for a particle to traverse the scale of the micrometer eyepiece of the microscope is noted. An observation can be made in 10 to 20 sec. The following illustrations of the application of the app. are given: (1) Elec. neutralization of clay suspensions by salts of Al. Expt. showed that it is the products of the hydrolysis of these salts ($AlCl_3$ and $Al_2(SO_4)_3$), rather than the Al, which are active and that adjustment of the p_H to about 5.2 is essential for the highest degree of efficiency. (2) Neutralization of clay suspensions by methylene blue in the presence of different electrolytes. The isoelec. ratio $\frac{\text{methylene blue}}{\text{clay}}$ was increased by anions and decreased by cations, the effect increasing with the valence. (3) Neutralization of the electronegative proteins in milk by methylene blue. The isoelec. ratio decreased as the acidity of the milk increased on aging. (4) Neutralization of colloidal materials in raw sugar and in molasses with methylene blue. There is a proportionality between the neutralizing power and the quantity of colloidal material present. (5) The electrokinetic behavior of $BaSO_4$. This material is by itself electropositive in the presence of excess Ba, electronegative in the presence of excess SO_4^{--}. The electropositive condition causes a decrease and the electronegative condition an increase in the p_H. The former phenomenon is explained on the basis of difference in soln. tension of Ba and SO_4 and the latter on differential adsorption of the H and OH of H_2O. (6) The formation of a turbid suspension before dissolving of $Na_4Fe(CN)_6$. The crystal chips which in H_2O

break away from the larger crystals carry an extraordinarily high electronegative charge. The great soln. tension of the highly hydrated Na and the low tension of the quadrivalent anion are held responsible for the behavior. In conclusion it is pointed out that all electrolytes may give rise in H_2O to a dissocn. potential difference at the phase boundaries, the sign of charge being detd. by the soln. tension and osmotic pressure of the resp. ions. But the cause of the electronegative charge of the great no. of inert materials is to be sought in the adsorbed layer of oriented H_2O mols. which apparently attract the anions to the interfacial side of this layer, giving rise to an adsorption potential. Adsorbed H_2O is held to be more acidic than free H_2O.
F. L. Browne

Copper hydrosols of low electrical conductivity. G. T. R. Evans. Univ. Witwatersrand, Johannesburg, S. Africa. *Trans. Faraday Soc.* **24**, 409–12(1928).—The cond. of colloidal Cu solns. prepd. by the Bredig arc method is given for ranges lower than those recorded in previous papers. The values vary from 0.30 mho./cc. to 0.57 mho./cc. The cond. water used was prepd. with utmost care. In every case the cond. of the water is greater than that of the Cu sol. This may be due to adsorption of the impurities by the Cu sol or to some action by which ions are removed from soln. The sols are very stable but after storage for several months the cond. increased. This effect is not explained. A. J. Currier

"Solid-phase" rule in the production of coarsely disperse systems. Wolfgang Ostwald, Walter Steinbach and Rudolf Kohler. *Kolloid-Z.* **43**, 227–32(1927).—The rule that in the direct dispersion of a substance to form a colloidal system the amt. of substance peptized at first increases, passes through a max., and subsequently decreases with the amt. of the solid phase present also holds for the production of coarsely disperse suspensions and emulsions. Results in accordance with the rule were obtained in the emulsification of olive oil and water (with or without the addn. of an emulsifier) and in the stabilization of suspensions of charcoal by picric acid, aniline and pyridine. It is shown that picric acid not only has a stabilizing effect on a suspension of charcoal but also causes partial dispersion. B. C. A.

"Solid-phase" rule. Wolfgang Ostwald. *Kolloid-Z.* **43**, 249–67(1927).—An attempt is made to classify the various types of peptization under the following headings: adsorption-peptization (*e. g*, C in picric acid), dissoln.-peptization (metal hydroxides in acids), peptization of swelling substances (gelatin), spontaneous colloidal dissoln. (colloidal dyes), peptization with chem reaction (formation of basic Bi nitrate sol by hydrolysis of the neutral salt). The "solid-phase" rule, according to which the amt. of peptized colloid is not independent of the amt. of solid phase present, can be explained by the principles of adsorption. If the amt. of solid phase is small, adsorption is great and the substance tends to be pptd.; on the other hand, with a large excess of solid phase adsorption is so small that little colloid-chem. effect is produced. Consequently, peptization is greatest for medium amts. of the solid phase. This view explains why the solid-phase rule applies also to the production of coarse suspensions and emulsions.
B. C. A.

The influence of lyophile colloids on the precipitation of salts—agar-agar and lead iodide. Thomas Robert Bolam. Univ. of Edinburgh. *Trans. Faraday Soc.* 24, 463–70(1928).—Cond. measurements on the solns. agar, Pb nitrate, KI, agar-KNO_3, Pb nitrate-KI showed that agar keeps Pb iodide in supersatd. soln. and prevents the pptn. of PbI_2. The PbI_2 is not in colloidal suspension since there is no color change as would be expected for a PbI_2 sol. The cond. of a mixt. of agar and salt is always less than the sum of the sep. conductivities. With Pb salts this is due to the formation of Pb sulfate, the H_2SO_4 being derived from the agar. Arthur Fleischer

Studies on the reason for a rubber-like condition of matter. P. P. von Veimarn. *Kolloid-Z.* **46**, No. 1, 38–40(1928).—Silk fibers swollen in NaI soln. and then coagulated in sodium citrate soln., exhibit considerable elasticity, which is improved by moderate mastication and destroyed by excessive mastication. An analogy is drawn to the behavior of rubber. Ultramicroscopic examn. of swollen silk fibers during elastic period shows a definite spiral structure which is lost by excessive mastication or swelling. The deduction is drawn that for elastic properties to exist a structure of spiral fibers in an amorphous matrix must be had. L. F. Marek

Preparation of negatively charged sols by means of tartaric acid. I. Properties of compounds of oxides of tin and titanium with tartaric acid. A. V. Dumanski and A. G. Kniga. *Kolloid-Z.* **44**, 273–7(1928); cf. *C. A.* **22**, 4028.—Measurements have been made of the d., viscosity, optical activity and elec. cond. of solns. of tartaric acid contg. progressively increasing quantities of $Sn(OH)_4$ and $Ti(OH)_4$, resp. The hydroxides were used in a freshly pptd. condition by adding NaOH to the tetrachlorides of the

metals. The results indicate that the reaction between tartaric acid and $Sn(OH)_4$ or Ti hydroxide can be sepd. into 2 stages: in the first stage, both the optical activity and the ionic concn. increase, and in the second stage the optical activity continues to increase while the ionic concn. remains constant. The d. and viscosity of the solns. increase linearly throughout. It is considered that the second stage denotes a colloid-chem. process, in which the excess of metallic hydroxide is peptized by the tartaric acid. Such solns. exhibit the Tyndall effect. The colloid particles migrate to the anode under a p. d. The formation of colloid can be observed when the ratio of tartaric acid to stannic oxide reaches 5:1. In the coagulation of SnO_2 sol by Na, Ba or Al chloride Schultze's rule is not followed quantitatively. B. C. A.

Charge and particle size. R. Keller. *Kolloid-Z.* **44**, 324–6(1928).—The colloidal state of matter is characterized not only by the size of the particles of the disperse phase, but also by a minimal and maximal electrostatic charge with respect to the dispersion medium. The part played by the ions in the charging of a colloid is small, especially in regard to the ions of strong acids and bases. An analogy is drawn between the elec. relations of colloid particles and mols., and it is considered that in both cases the surface charge shows itself in an elec. field through selective adsorption at one of the electrodes. B. C. A.

Distribution of particle size in reversible polydispersed systems. N. von Raschevsky and E. von Raschevsky. *Z. Physik* **46**, 300–4(1927).—By applying Planck's theory of dil. solns. to a polydispersed system considered as a mixt. of monodispersed systems, the characteristic function and distribution function have been detd. B. C. A.

Kinetic investigation of the peptization of aluminum hydroxide. Wolfgang Ostwald and Herbert Schmidt. *Kolloid-Z.* **43**, 276–95(1927).—The course of the peptization of $Al(OH)_3$ gel prepd. from NH_4 alum was followed by gravimetric and potentiometric methods. The general character of the peptization-time curves resembles that of a coagulation-time curve, being autocatalytic, or S-shaped. No relation could be found between peptization and H-ion concn., the effect depending rather on the anion of an acid. Buffer solns. of the same H-ion concn., but contg. different amts. of neutral salt behave quite differently. Many strong acids, such as H_2SO_4 and H_3PO_4, do not peptize $Al(OH)_3$. B. C. A.

Kinetic studies on the formation of starch paste. I. Formation of starch paste in the cold. Wolfgang Ostwald and Gerhard Frenkel. *Kolloid-Z.* **43**, 296–312(1927).—A study has been made of the formation of paste from starch suspensions under the influence of various added substances, and of the effect of varying the concn., temp., moisture and previous treatment. The substances which facilitate the change are Na, K and NH_4 thiocyanates, NaOH and KOH, HCl, Na salicylate and carbamide. The viscosity curve of the process is S-shaped, like that of the setting of plaster of Paris. The exptl. curves can be divided into 3 groups, according to the portion of the S-shaped curve which can be realized. The addn. agent becomes effective at a certain critical concn. and has a large "concn. coeff." The concn. of the starch suspension and the temp. are also of great influence on the velocity of formation of paste. Different velocities were found for different kinds of starch, and thus this effect can serve as a means for the characterization of starch. B. C. A.

The condition of the micelles in starch. G. Malfitano and M. Catoire. Paris. *Kolloid-Z.* **46**, 3–11(1928).—A general theory of colloids is advanced; starch is used as illustrative material for explaining it. The theory is based on 4 postulates: (1) The micelles which characterize the colloid state are complexes of a high order, that is, the units out of which they are built are neither atoms nor mols. but "mols. composed of mols." These structural units may be thought of as complexes in Werner's sense, as "polymers of polymers," or as crystals made up of micro-crystals. (2) The structural units of colloids have a dual nature, uniting electrolytes on the one hand with nonelectrolytes on the other. The duality is usually an essential condition for the colloid state, although electrolyte-free colloids can sometimes be extd. from electrolyte-contg. colloids to which this rule no longer applies. (3) In building a micelle with nonelectrolytic mols., the nucleus must be an electrolyte ion, that is, a complex in Werner's sense must be formed. It is theoretically very improbable that nonelectrolytic mols. form groups with electrolyte ions at the surface only in view of the fact that the ions are present from the beginning and play a part in the aggregation. Expt. proves that the ions are characteristic of the colloid and can neither be removed nor substituted without tearing down the micelle. Adsorption of ions may occur in addition, but it does not suffice to explain the facts. (4) The dependence of ionization and consequent dispersion upon the nature and valence of ions of charge opposite to that of the micellar

ion is the generally recognized principle for explaining stability, coagulation, sedimentation and gelation. With the true colloids this dependence expresses itself in deep-seated and irreversible changes in the condition of the micelle, especially if the ions are multivalent. F. L. BROWNE

Phenomena of dyeing colloidal grains. A. BOUTARIC AND F. BANÈS. *Compt. rend.* **187,** 117–9(1928).—Other coloring materials behave similarly to eosin in not becoming fixed on colloidal granules in the sol state (cf. *C. A.* **22,** 2698). The colloidal flocculating agents behave as dead cells and fix all the colors, the adsorption in the case of the vital colors being stronger than that exercized by the granules in the sol state L. D. R.

Theory of peptization. II. A. VON BUZAGH. *Kolloid-Z.* **43,** 215–20(1927); cf. *C. A.* **22,** 1078.—Variations in the concn. of the colloidal soln. with the proportion of solid phase are found in the peptization of palmitic acid by alkali hydroxides and of S gels. The time must be regarded as a variable in peptization processes, since there may be either aging of the sol or a slow change in the compn. and state of the solid phase. In the peptization of $Fe(OH)_3$ gel the concn. of the sol decreases with time if a large amt. of the solid phase is present. The compn. of the latter may change also because of hydrolytic processes. **III. Peptization by means of hydrophilic sols.** *Ibid* 220–4.—When sols are used as peptizing agents the curve connecting quantity of colloid dissolved and amt. of solid taken exhibits a max. as in the case of peptization by electrolytes. The systems investigated were the peptization of charcoal and of $Fe(OH)_3$ by various soap solns., of kaolin by humic acid, and of $Al(OH)_3$ by alk. alizarin solns. B C. A.

Solubility, swelling and adsorption of cellulose in alkali. W. VON NEUENSTEIN *Kolloid.-Z.* **43,** 241–9(1927).—The amt. of cellulose dissolved in alkali depends on the amt. of cellulose taken (cf. v. Buzagh, preceding abstr.), and it is probable that both adsorption and peptization processes take place. The degree of swelling of cellulose in water and alkali is similarly affected, and it is suggested that the content of electrolytes or of decompn. products in the cellulose may have an influence on the swelling. B. C A

Coagulation of colloids by electrolytes. A. I. RABINOVICH AND R. BURSTEIN *Papers pure appl. Chem. Karpow Inst., Moscow* **1927,** *Festschrift Bach* 35–53; *Chem Zentr.* **1927,** II, 1007; cf. *C. A.* **21,** 683, 2411.—*Mastic* emulsions were prepd. by (*a*) pouring water into an alc. mastic soln. and filtering, and (*b*) pouring the alc. mastic soln. into water and filtering. The *b*-sol. leaves a larger residue on filtration. Accurate conductometric titration is impossible with the *b*-sol while the *a*-sol gives concordant results. Potentiometric titrations showed that both sols are weak acids The H-ion concn. detd. conductometrically is greater with the *b*-sol then when detd potentiometrically. With the *a*-sol both methods give the same value. The *b*-sol consists of larger particles than the *a*-sol. The fact that the *b*-sol is too weak an acid for conductometric detn. is ascribed to the retention of the stronger acids with the larger particles on the filter. Upon coagulation of the sols with neutral salts no acidity develops, in contrast with As_2S_3 sols. Upon coagulation with $La(NO_3)_3$ the cation is carried down with the ppt. in a quantity equiv. to H ion present in the sol as detd potentiometrically. The equiv. quantity is insufficient to cause rapid coagulation. The coagulation value for ions with a valence of 3 and 4 is about 5–10 times the H ion equiv. In conformity with the Hardy-Schulze law it is still higher for uni- and bivalent ions. J. S. REICHERT

The coagulation of colloids with electrolytes. II. Conductivity study of the processes of coagulation of arsenic trisulfide sols. ADOLPH I. RABINOVICH AND V. A. DORFMAN. Karpov-Inst. of Chem., Moscow. *Z. physik. Chem.* **131,** 313-37(1928). cf. *C. A.* **1,** 683.—Successive addns. of solns. of electrolytes to As_2S_3 sol first increase the cond. very rapidly, then more slowly and finally the increase is linear. The rapid rise of the cond. at the start of the titration is due to the removal of the H ions by the cations of the added electrolyte. The beginning of the linear portion of the cond curve denotes the end of this H-ion-removal process, and coincides with the min. in the titration curve with caustic. The acidity calcd. from the cond. curve agrees with that found by an indirect method, but does not agree with values detd. by potentiometric measurements with a quinhydrone electrode. Upon diln. of the sol, the position of the turning pt. in the cond. curve is directly proportional to the sol concn. and inversely proportional to the concn. of the electrolyte. As the concn. of the sol increases, the difference between the coagulating value of cations of different valence decreases. The Schulze-Hardy rule is valid only for the coagulation and not for the position of the turning points in the curves, which indicates only the end of the H-ion removal

by the adsorbed ions. The difference between these two processes is strongly differentiated. The adsorption of cations of different valence reaches its max. at approx. equal equiv. concns. but the amts. adsorbed seem to be different. The dependence of the K_w of the cations of different valence upon the diln. of the As_2S_3 sols seems to be against the assumption that the coagulation can be explained by assuming that the soly. product is exceeded by the added stabilizing ion. J. H. PERRY

Coagulation of colloids by electrolytes. III. Potentiometric titration of the coagulation of ferric hydroxide sols. A. I. RABINOVICH AND V. A. KARGIN. *Z. physik. Chem.* **133**, 203–32(1928); cf. *C. A.* **21**, 683, 2411.—The chem. changes which occur during the coagulation of $Fe(OH)_3$ sols by electrolytes have been followed by potentiometric titration. The replacement of Cl ions by ions from the colloidal particles and the adsorption of ions by the latter may be thus investigated. It is found that the adsorption and the replacement of Cl ions do not take place according to the usual adsorption isotherms, but partake more of the nature of a chem. reaction. Coagulation usually occurs only after the whole of the Cl has been replaced by the anions, and in those cases in which it takes place previously, the replacement takes place from the ppt. During the titration the Cl ions are replaced by more than the equiv. quantity of other anions, the effect being greater the higher the concn. of the sol and of the coagulating electrolyte. Since there is no corresponding replacement of cations, the pos charge on the colloidal particles must be increased by the addn. of electrolyte to the sol. This conclusion has been verified by cataphoretic measurements. B. C. A.

Effect of nonelectrolytes on the stability of colloids. I. Arsenious sulfide sol. SUBODH G. CHAUDHURY. Univ. Calcutta. *J. Phys. Chem.* **32**, 1481–7(1928).—MeOH sensitizes As_2S_3 hydrosol toward $BaCl_2$ while EtOH stabilizes it. There is no parallelism between the influence of the alcs. on coagulation and their influence on the adsorption of Ba^{++}. Both MeOH and EtOH sensitize As_2S_3 sol toward HCl and reduce the velocity of cataphoretic migration. The potential of the As_2S_3 particles near the coagulating concn., detd. by cataphoresis, is higher in the case of uni-univalent electrolytes (HCl and KCl) than it is in the case of bi-univalent electrolytes ($BaCl_2$). It is suggested that the interfacial tension between particles and dispersion medium is greater in the former than in the latter case because of the higher electrolyte concn. and as a result there is greater tendency for the particles to coalesce. The conclusions are drawn that nonelectrolytes affect the coagulating power of electrolytes for colloids by (1) decreasing the dielec. const. so that coagulation takes place at a higher particle charge (sensitization) and (2) altering the interfacial tension, which also affects the potential at which coagulation takes place. F. L. BROWNE

Salting out of gelatin into two liquid layers with sodium chloride and other salts. J. W. MCBAIN AND F. KELLOGG. Stanford Univ. *J. Gen. Physiol.* **12**, 1–15(1928).—The conditions under which gelatin may be salted out into 2 liquid layers at 35° were investigated. With NaCl the equil. governing the amts. and compn. of the layers accord with the requirements of the phase rule for the quarternary system, gelatin NaCl-H ion-water. Soaps and gelatin are remarkably similar in behavior. If anisotropic regions corresponding to neat soap and middle soap are possible for gelatin, they must occur in regions where the gelatin concn. is greater than 40%. The term coagulation as applied to the salting out of proteins is a misnomer. C. H. R.

The relation between coagulation, electrokinetic migration velocity, ionic hydration and chemical influences. An experimental study of clay, quartz and permutite suspensions. PAULI TUORILA. *Kolloidchem. Beihefte* **27**, 44–188(1928).—The velocity of electroëndosmosis of water against glass surfaces was lowered by electrolytes according to the following series of cations: LiCl < NaCl < KCl = KNO_3 < $AgNO_3$ = CsCl < HNO_3 < HCl. The velocity of cataphoresis of the particles of a paraffin sol was lowered by the same electrolytes in the same order except that CsCl < $AgNO_3$, and in the case of clay particles, $AgNO_3$ > CsCl. In all concns. the order of Li, Na, K, Cs and H remained the same, but the migration velocity-concn. curve for $AgNO_3$ cut the curves for KCl and CsCl. The velocity of coagulation of these suspensions was speeded up by these electrolytes in the same order as the cataphoresis velocity was decreased except that the place of H in the series was dependent on the concn. of electrolyte used. The relation between migration velocity and time of coagulation could be expressed by an equation. With bivalent cations, the migration velocity of these suspensions was decreased in the order $MgCl_2$ < $CaCl_2$ < $SrCl_2$ < $BaCl_2$ and the decrease in the time required for coagulation followed the same order. Results are also presented for the effect of salts with acids and with bases, the velocity of coagulation still being related to migration velocity. The coagulation of mixts. of sols having particles of the same and opposite charge was also investigated. J. G. MCNALLY

Coagulation of sols with organic substances and salts. I. BR. JIRGENSONS *Biochem. Z.* **195**, 134–41(1928).—The coagulation of casein and albumin sols proceeds more rapidly when the combined action of org. substances and salts is made use of than when either alone is employed. When, however, the coagulation is made with large concns. (30–50% alc. or 0.2–1.2 *M* salt per l.) there is a slowing up of the coagulation in the case of org. substances with a low dielec. const. and the stabilization is greater the larger the concn. of the org. substance and salt. S. MORGULIS

Coagulation by uranyl salts. A. PIL. *Natuurw. Tijdschrift* **7**, 17–8(1925).—A 5% gelatin soln. with KBr coagulates on addn. of uranyl nitrate or chloride. KBr can be replaced by NaCl, KI or $BaCl_2$; the uranyl salts by themselves do not cause coagulation. Only traces of halide are necessary for the effect. B. J. C. V. D. H.

Coagulations. GEORG WIEGNER. Eidgen. Techn. Hochschule, Zurich. *Z. Pflanzenernähr. Düngung. B.* **11A**, 185–228(1928).—If the elec. discharge of particles is considered responsible for the coagulation of colloidal suspensions, then 2 types of coagulation must be differentiated. The coagulation is rapid if the elec. discharge of the particles is complete. It is slow if the particles are only incompletely discharged under a definite crit. elec. potential. If after complete or only partial elec. discharge of the particles, the contact of the particles due to the Brownian movement occurs with the same degree of probability in all directions of the vol., then, the term to be applied to the coagulation is a "rapid or slow *perikinetic* coagulation." If the probability of the contact of the particles is greater in one direction than in another, as is the case in the one-sided movement of larger particles among small particles as a result of an outer force such as gravity or centrifugal force, then the coagulation is called "rapid or slow *orthokinetic* coagulation." The slow or rapid perikinetic coagulation can occur in mono- or polydispersed systems; on the other hand, the orthokinetic coagulation due to its nature can only occur in polydispersed systems. It is necessary in the study of soil colloids sharply to differentiate: (*a*) rapid perikinetic coagulation of monodispersed systems, (*b*) slow perikinetic coagulation of monodispersed systems, (*c*) rapid perikinetic coagulation of polydispersed systems, (*d*) slow perikinetic coagulation of polydispersed systems, (*e*) rapid orthokinetic coagulation of polydispersed systems, (*f*) slow orthokinetic coagulation of polydispersed systems. From expts. on monodispersed gold sols of amicroscopic to almost microscopic size using the ultramicroscopic counting method, it was found that the law of M. v. Smoluchowski is applicable for the rapid perikinetic coagulation of monodispersed systems. Kaolin dispersions also obeyed this law. The slow perikinetic coagulation of monodispersed systems was investigated by the ultramicroscopic counting method. From the laws of M. v. Smoluchowski, the no. of active contacts of the ultramicrons at incomplete discharge can be calcd. It is correlated in definite cases with the hydration of the ions. H. Mueller has calcd. the rapid perikinetic coagulation of polydispersed systems and the formulas have been substantiated by G. Wiegner and P. Tuorila on gold sols. They are also applicable for clay dispersions. Polydispersed systems coagulated much more rapidly than monodispersed systems with the same no. of particles at the beginning of the coagulation. The difference between mono- and poly-dispersed systems having the same no. of particles is noticeable in a poly-dispersed system first when the difference between the radii of the particles in the polydispersed system is of the order 1:10. The masses of the particles are then in the same system 1000 times differentiated. The influence of the difference of the particles on the course of the perikinetic coagulation of polydispersed systems is then small, which is of significance in geology and soil science. The laws of the rapid and slow orthokinetic coagulation have been developed by P. Tuorila. Formulas were developed which apply under definite, exactly controlled conditions for the case when, after the elec. discharge of the particles, some groups of large particles fall through another group of smaller particles. The effect of orthokinetic coagulation is often of as much importance as the perikinetic coagulation in the crit. examn. of sedimentation—in suspensions—as in the mech. analysis of the soil. P. Tuorila has changed the sedimentation app. of Wiegner so that these orthokinetic coagulations may be observed in 2 different heights of the original dispersion. R. M. BARNETTE

Sol-gel systems with anisotropic particles. I. Dibenzoylcystine. H. ZOCHER AND HANS W. ALBU. Kaiser-Wilh. Inst. für physik. Chem. u. Elektrochem. *Kolloid-Z.* **46**, 27–33(1928).—Dibenzoylcystine jellies were observed under the microscope. Strong double refraction when the jellies are deformed indicates that they are built up of colloid particles that are positively birefringent needles whose diam. is far beyond the resolving power of the microscope. Only after long aging do the particles become large enough to be seen. A weak double refraction in the unstressed jellies indicates

that they are composed of spheres which in turn consist of aggregates of little needles arranged radially. On evapg. a gel to dryness a resinous film is obtained in which the needle-shaped crystals are arranged radially. The film is negatively birefringent like the crystals of pure dibenzoylcystine obtained in alc. On moistening the film with H_2O or dil. salt solns. the double refraction changes to positive. This points to the existence of a hydrate in the jellies. Observation in the polarization microscope with dark field of jellies in EtOH reveals needles as well as crystals that cannot be resolved. On aging the needles form threads. Jellies in alcs. of higher mol. wt. exhibit threads at once. At suitable concn. sols were obtained that appear streaked by reflected light and in the polariscope show positive double refraction while flowing. The nature and amt. of dispersion medium influence the double refraction. Dichroism results when the systems are colored with methylene blue or neutral red. **II. Barium malonate.** *Ibid* 33–6.—Study was made of the influence of different conditions of prepn. on the streaked aspect of Ba malonate jellies. In anhyd. glycerol the jellies are clear like water, but the streaked jellies made in com. glycerol are turbid, the turbidity increasing with increasing content of H_2O. All of the jellies are thixotropic, the H_2O-free ones especially. Jellies made in MeOH without any glycerol are stable for a long time if they are kept out of contact with air. Addn. of H_2O produces markedly streaked sols with powerful double refraction when flowing. These jellies, like those of $Mn_3(AsO_4)_2$, have normal optical properties. F. L. BROWNE

Influence of slightly soluble substances on the thixotropy of ferric oxide sols. H. FREUNDLICH AND K. SOELLNER. *Kolloid-Z.* **44,** 309–13(1928).—The accelerating influence of metals on the thixotropic change of Fe_2O_3 sols contg. NaCl is explained in the following way. Direct measurements have shown that the time of setting increases with increasing H-ion concn., and it is considered that the metals dissolve in the weakly acid Fe_2O_3 sol contg. $FeCl_3$ to a sufficient extent to diminish the H-ion concn., and thus the time of setting. The ions of the metal are without influence. Pure Au and Pt are not sufficiently sol. in the acid soln. to produce any effect. These results are confirmed by semi-quant. expts. in which a large no. of sparingly sol. substances (elements, oxides, sulfides, silicates, etc) were added. A marked difference was found between the effects produced by a sol. and an insol. steel. Substances such as graphite and S were without influence, but a pos. effect was produced by oxides of Fe. In agreement with theory, a metal is effective when sepd. from the sol by a collodion membrane. B. C. A.

Dependence of the viscosity of gelatin solutions on temperature. A. FODOR AND KURT MAYER. *Kolloid-Z.* **44,** 314–5(1928).—By means of the Ostwald viscosimeter, measurements were made of the viscosity of gelatin solns. with and without addn. of acid or alkali between the temps. 22° and 26°. The viscosity of an aq. soln. of gelatin has a higher temp. coeff. than that of a gelatin soln. contg. acid or alkali. It is inferred that solvation of the particles is not the primary cause of the increase in viscosity, and that the important feature is the formation of an adsorption compd. between the gelatin and acid or alkali. B. C. A.

Turbidity phenomena in gelatin. KURT MAYER. *Kolloid-Z.* **44,** 315–9(1928).—The turbidity of solns. of electrodialyzed gelatin was measured in an "extinctiometer" at various temps. between 12.5° and 27.5°. For each temp. a max. occurs at 1.8% of gelatin, and the turbidity is less at higher temps. The fall in turbidity with rising temp is greatest for a 1% soln. Examn. of the effect of H-ion concn. on the turbidity shows that two maxima occur, at p_H 5.2–5.4 and p_H 4.0–4.2. It is possible to purify gelatin by electrodialysis without previous dialysis by working with a small current d. and membranes with large pores, and maintaining a rapid flow of water in the anode and cathode chambers in order to remove the electrolytes. B. C. A.

The lyotropic properties of the nitrite ion. D. DEUTSCH AND S. LOEBMANN. Kaiser Wilh Inst. für physik. Chem. u. Elektrochem. *Kolloid-Z.* **46,** 22–3(1928).—The investigation was made because many pharmacol. properties of nitrites are explained upon the basis of the position of NO_2^- in the lyotropic series. The molar elevation of the surface tension of H_2O is found to be 1.2 dynes/cm., a value much less than that for $NaNO_3$, NaCl or NaF. The coagulating power of KNO_2 for Fe_2O_3 hydrosol is slightly greater than that of KCNS and much greater than that of KCl and of KNO_3. The order in which the ions influence the partition of the red form of rhodamine O between C_6H_6 and H_2O in the direction of increased concn. in C_6H_6 is $Cl^- < NO_3^- < I^- < SCN^- < NO_2^-$. The position of NO_2 in the Hofmeister series near I^- and SCN^- indicates that it is weakly hydrated. F. L. BROWNE

The influence of hydrogen-ion concentration and electrolytes upon the turbidity, sensitivity and settling rates of certain Pleistocene clays. HOYT C. GRAHAM AND J. N.

PEARCE. State U. of Ia. *Proc. Iowa Acad. Sci.* **34,** 217-8(1927).—The relative turbidities of the permanent colloidal suspensions from the different strata have been measured by means of a specially constructed tyndallmeter. The amt. of clay which can be held in H_2O suspension depends upon the stratum from which the clay was obtained, upon the H-ion concn., and upon the concn. of the electrolyte present in the suspension. Insofar as the work has proceeded, it was found that the turbidity attainable is greater for the oxidized and leached strata than for the gumbotil; furthermore, for any one stratum, the max. permanent turbidity is greater in the Kansan than in the Nebraskan. The relative turbidity increases with increasing p_H value until a certain max. turbidity is reached, and then it decreases rapidly with further increase in p_H. Except in the Nebraskan gumbotil, the max. turbidity for each clay is found at almost identically the same p_H, *viz.*, 10.5. W. G. GAESSLER

Liesegang rings and periodic precipitation. ERNEST S. HEDGES. *Chemistry and Industry* **47,** 710-2(1928).—The phenomenon may involve some fundamental principle and also interests biologists and geologists and has a literature of between 200 and 300 papers. The supersatn. theory of Wilh. Ostwald states that 2 reactants diffuse into one another and with $AgNO_3$ and $K_2Cr_2O_7$ a supersatd. soln. of $Ag_2Cr_2O_7$ is formed, the pptn. of which is delayed. By the time the ppt. has formed at the boundary of the reacting substances the gel near the ppt. is impoverished of $K_2Cr_2O_7$. Thus the advancing $AgNO_3$ has to travel some distance before it can again make the supersolv product with the $K_2Cr_2O_7$ ions and this accounts for spaces between the bands. S. L. B. ETHERTON

Organic rhythmic structures. M. COPISAROW. *Kolloid-Z.* **44,** 319-23(1928).—Rhythmic ppts. were obtained in the diffusion of picric acid, tannic acid, lactic acid, phenol, phosphoric acid and α-trinitrotoluene into gelatin. At low concns. of the colloid, striated structures without definite ring formation were produced, the rings becoming definite at a certain higher concn. of colloid. The value of this concn. depends on the quality of the gelatin. The best qualities of gelatin, or those contg. the smallest quantities of hydrolysis products, tend to form honeycomb structures, rather than stratified ppts. The expts. with tannic acid indicated a tendency towards the formation of spirals in place of rings. Rhythmic ppts. were not produced in the diffusion of pyridine, benzaldehyde, oil of wintergreen, gallic acid, and *o*-nitrophenol into gelatin, isinglass and agar. B. C. A.

A physical factor in the Liesegang phenomenon. SATYENDRA RÂY. *Kolloid Z.* **44,** 277-9(1928).—An expression is derived which gives the relation between the d and the height of a colloidal suspension. According to this there are 3 possible height for certain ds. This is considered to be the primary cause of the periodicity in Liesegang rings. B. C. A.

Ultrafiltration. STANISLAW SIERAKOWSKI. *Med. Doswiadczalna i Spoleczna* **8,** 419-34(1928).—A description of methods. JAROSLAV KUČERA

The precipitation rule in the formation of oil emulsions. RUDOLF KÖHLER. *Kolloid-Z.* **45,** 345-8(1928).—In the emulsification of olive oil and of peanut oil contg. oleic acid with dil. Na_2CO_3 or NaOH solns. the amt. emulsified at const. alk. concn. and proportion of H_2O depends upon the amt. of oil. At low concns. of alkali and of free fatty acid in the oil the amt. emulsified is max. at an intermediate proportion of oil. Increasing the concn. of alkali increases the amt. of oil emulsified. The observations are explained by application of Ostwald's pptn. rule for adsorption peptization. F. L. BROWNE

Viscosity and hydration. IV. Fluids separated by syneresis and the theory of syneresis. S. LIPATOV. *Biochem. Z.* **192,** 91-104(1928); *J. Russ. Phys.-Chem. Soc.* **60,** 467-83; cf. *C. A.* **22,** 1081.—The solns. formed from dried gelatin, agar or geranin vary with the conditions of temp., medium and content of electrolytes. When a soln. of geranin at 50° is cooled to 18°, a sol or gel is obtained according to the concn. Such a system consists of a satd. soln. in the mol. or ionic form and hydrated colloidal particles. Phase sepn. does not coincide with gelatinization, but is present already in sol and gel. Such sepn. increases gradually and leads to syneresis. The concd. colloidal phase may contain a larger amt. of water than the dilute phase and the latter may not exist at all, the whole of the water being necessary for hydration. During gelatinization, the particles which sep. from the satd. soln. gradually coalesce and ppt. as hydrated complexes, the velocity of the process depending on the distance between the particles, being greater the greater the gel concn. A 0.4% gel shows syneresis after 30 days and a 0.8% gel after 2 days. B. C. A.

Relations of the solid phase in the swelling and dissolution of gelatin. WOLFGANG OSTWALD AND RUDOLF KÖHLER. *Kolloid-Z.* **43,** 233-40(1927).—The swelling of

gelatin is influenced by the ratio of the solid phase to the vol. of liquid, the relative swelling falling as this ratio increases. The numerical values obtained by Küntzel (*C. A.* **21,** 3059) for the swelling of gelatin in HCl are plotted and lead to a quant. statement of this relation. This takes the form $q/m = kv^n$, where q is the degree of swelling, m the amt. of gelatin, v the relative amt. of liquid, and k and n are consts. It is shown that these results, are not due to the liquid being impoverished of H ions through the presence of large amts. of the solid phase. Also, similar effects were observed with 3 different types of gelatin in pure water. The spontaneous soln. of gelatin in pure water increases with increasing amt of the solid phase. It is possible to obtain in this way at 20° a weakly viscous, non-gelatinizing soln. contg. 2.5%. The influence of the amt. of the solid phase on both the relative swelling and the spontaneous dissoln. of gelatin is markedly less at lower temps. The curves are similar to those obtained by von Neuenstein (*C. A.* **22,** 1472) for the spontaneous soln. of cellulose derivs., and it is therefore considered that gelatin is a mixt. of "state-isomerides" having different spontaneous soln. tendencies. B. C. A.

Flow of starch pastes at high and low rates of shear. F. D. Farrow, G. M. Lowe and S. M. Neale. *J. Textile Inst.* **19,** 18-31T(1928).—The flow of starch pastes and of castor oil in capillary and Couette viscometers have been measured at 20° over a range of shear of 300,000-fold; within this range the viscosity of castor oil is const. A method is described whereby the results of viscosity measurements in these instruments may be used to calc. the simple shearing stress and velocity gradient at a definite point in the fluid. A graph of the values so obtained expresses in a manner independent of the instrument the variation of flow with shearing stress for the liquid investigated. The stress-shear curve for starch pastes is quite continuous and either passes through or terminates close to the origin. While it does not hold even approx. over the whole of the range examd., the relation $F^N = \eta dv/dy$ appears to describe the flow of starch pastes better than any other two-const. equation and serves as a useful and accurate interpolation formula within the range usually covered by any one type of instrument. Results of measurements made in capillary tubes are expressed in terms of stress and strain, and therefore made independent of instrument dimensions and comparable with data obtained by the use of other forms of viscometer, by the use of a formula based on the above relation, *viz.*, $(Pr/2l)^N = \eta(V/t)(N + 3)/\pi r^3$, where r is the radius and l the length of the tube, P the driving pressure, and V the vol. of liquid flowing in time t. The method is applied to results given by Freundlich and Schalek (*C. A.* **18,** 1598) for the flow of benzopurpurin sols in both capillary and rotating-cylinder viscometers, and it is shown that the discrepancy between the apparent viscosities as detd. by the 2 methods then disappears. B. C. A.

Solubility of copper in milk. E. I. Soloman with G. N. Quam. Coe College, Cedar Rapids, Ia. *Proc. Iowa Acad. Sci.* **34,** 216-7(1927).—The solubilities of Cu in sweet whole raw milk held at a const temp. for 30 min. were detd. for temps. ranging from 20° to 100°. Cu sheets of known dimensions were totally immersed and agitated in milk for 30 min. at the specified temp. Soly. values were detd. by difference in wt. of the Cu sheets and also by detg colorimetrically with K ethyl xanthate the Cu present in the ash of the milk. Solubilities per unit area increase with rise in temp. up to 80°. W. G. Gaessler

Effect of the position of substitution on the ionization constants of some organic acids. D. A. MacInness. Rockefeller Inst. for Med. Res. *J. Am. Chem. Soc.* **50,** 2587-95(1928).—The ionization consts. of Cl- and OH-substituted aliphatic acids follow the formula $\log K_a = C + S(1/d)$ in which $d = 1$ for the α position, 2 for β, etc. This equation follows if the substituting and COOH groups repel each other according to the inverse square of the distance between their polar bonds and if the free energy of ionization is increased in proportion to the mutual potential energy of the 2 groups. Cl derivs. of PhCOOH follow the formula accurately if the o distance = α distance and a slightly puckered ring structure for C_6H_6 is assumed. Br- and I-substituted aliphatic acids show small systematic deviations. Corresponding aromatic compds. agree closely. Foster Dee Snell

Detection of small differences in the hydrogen-ion concentration of solutions. W. Kesting. *Z. angew. Chem.* **41,** 358-60(1928).—Malononitrile reacts with α-naphthoquinone in solns. of $p_H > 2.5$ with the formation of an intensely blue soln., and the speed of the reaction increases with an increase in the p_H value. To compare the p_H of two solns., 5 cc. of each is placed in sep. test tubes and 5 drops of a 0.2% alc. soln. of malononitrile added to each, followed by 5 drops of a 0.3% alc. soln. of α-naphthoquinone. After shaking, the intensities of the colors are compared; differences of only 0.2 in the p_H value are readily apparent after a little practice In solns.

with $p_H > 11.5$, the addn. of the above reagents produces a green color and the test is no longer of value; in this case β-naphthoquinone is used instead of the α-compd. and the intensities of the red color produced in standard and test are compared. For solns. with relatively low p_H values benzoquinone gives more delicate color changes than either of the naphtho derivs. B. C. A.

Dissociation constant of glutimic acid. Vl. Zafouk. *Listy Cukrovar.* **46,** 631–4(1928).—By means of various methods and the app. described previously (*Listy Cukrovarnicke* **46,** 419(1927–28), the dissocn. const. was found to be (5.9×10^{-4}) at 25° and in dilns. ranging $M/16 - M/32$. Its const. lies between that of tartaric (9.7×10^{-4}) and lactic (1.3×10^{-4}) acids. It constitutes one of the stronger acids found in molasses. Frank Maresh

Influence of neutral salts on acid-salt equilibria. II. Dissociation constants of citric acid. I. M. Kolthoff and W. Bosch. *Rec. trav. chim.* **47,** 558–75(1928); cf. *C. A.* **21,** 3524.—Measurements have been made of the p_H of mixts. of citric acid and its K salts at 18°, and the 3 dissocn. consts. of citric acid calcd. These are $K_1 = 8.2 \times 10^{-4}$, $K_2 = 1.77 \times 10^{-5}$, $K_3 = 3.9 \times 10^{-7}$. The effect of neutral salts on the p_H of the solns. has been studied. Anions are relatively inactive, but there is a well-marked cation effect in the order (Cs, Rb) < K = NH_4 < Na < Li. The influence of KCl can be calcd approx. from the Debye-Huckel equation, but this does not give good results for Na and Li salts. The calcd. av. size of the ions in mixts of di- and tricitrate is 6.2×10^{-8}, but a constant value is not obtained for the citric acid-monocitrate mixts., and it seems that the activity coeff. of the undissocd. acid is much larger than unity at moderate concns. It is proposed to replace for practical purposes the true dissocn. consts. quoted above, which refer to infinite diln. by "acid strengths," which represent the true dissocn. consts. corrected for the activity coeff. of the components. B. C A.

The influence of neutral salts on acid-salt equilibria. III. The second dissociation constant of carbonic acid and the influence of salts on the activity of the hydrogen ions in a bicarbonate-carbonate mixture. I M. Kolthoff and Wouter Bosch Univ. Utrecht. *Rec. trav. chim.* **47,** 819–25(1928); cf. preceding abstract.—The second dissocn. const. of carbonic acid at 18° is 4.4×10^{-11}. This value is arrived at by p_H measurements on solns. of mixed Na_2CO_3 and $NaHCO_3$, the calcns. being performed with the aid of the formulas of Debye and Hückel relating activity to ionic strength and ionic size. The influence of the neutral salts, chlorides of Li, Na and K, KBr, KI and K_2SO_4 on the p_H of dil. bicarbonate-carbonate mixts. is also studied. The influence found cannot be explained by the theory of Debye and Hückel. There seems to be a specific interaction of ions which depends on the nature of the cation of the neutral salt and the size and valence of the ions in the acid salt mixt. **IV. Third and fourth dissociation constants of pyrophosphoric acid and the influence of neutral salts on the activity of the hydrogen ions in a ter-quadrivalent and bi-tervalent pyrophosphate mixture, respectively.** *Ibid* 826–33.—In a similar way the *third* and *fourth dissocn. consts.* of *pyrophosphoric acids* at 18° are 2.1×10^{-7} and 4.06×10^{-10}, resp. The influence of neutral salts on the p_H of a very dil. mixt. of ter- and quadrivalent pyrophosphate is much larger than would be expected from the Debye-Huckel equation. This equation, however, fits the facts for the neutral salt effect on the bi- and tervalent mixt. very well, assuming the av. size of the ions of KCl is 3.7×10^{-8} cm. and for NaCl is 2.3×10^{-8} cm. Small traces of Li salts decrease the p_H of a quadrivalent pyrophosphate soln. very appreciably. This has application in analytical chemistry to testing Na pyrophosphate for alk. impurities and in the titration of pyrophosphoric acid as quadrivalent acid. R. E. Gibson

A derivation of the solubility-product law. Warren C. Vosburgh. *Proc. Iowa Acad. Sci.* **34,** 213–4(1927).—Stieglitz (*C. A.* **2,** 2638) pointed out that the derivation of the soly.-product law based on the application of the law of mass action to strong electrolytes is objectionable. Nevertheless many elementary textbooks still give it. Washburn (*C. A.* **4,** 1572) later gave a satisfactory thermodynamic derivation, and Butler (*C. A.* **18,** 2832) has more recently given a satisfactory statistical one. Another thermodynamic derivation is possible by using the now familiar concepts of free energy and activity. Lewis and Randall (*C. A.* **17,** 1918) have pointed out that in a satd. soln. of an electrolyte the mean activity of the ions is const. The reasoning by which this conclusion may be reached is as follows: A solid electrolyte is in equil. with its satd. soln. when the free energy of the solid is equal to the partial molal free energy of the substance in soln., (1) $F_s = \overline{F}_2$. By the definition of activity (2) $\overline{F}_s - \overline{F}_2 = RT \ln(a_s/a_2)$, where a_s is the activity of the solid and $\overline{F}_s$ is its free energy, and a_2 is the

activity of the solute and $\overline{F}_2$ is its partial molal free energy. Combining equations (1) and (2) and simplifying show that the two activities are equal. The activity of the solid is const. at const. temp. and pressure, and so the activity of the solute is const. also. The activity of the solute can be expressed in terms of the activities of its ions without assuming any particular theory of ionization. This gives (3) $a_2 = a_+^{\nu+}.a_-^{\nu-} = (a\pm)^{\nu_+ + \nu_-} = K$, where a_+ and a_- are the activities of the positive ion and the negative ion, resp., and ν_+ and ν_- are the nos. of moles of the 2 ions in one mole of the electrolyte. The mean activity is designated by $a\pm$ and K is a const. Lewis and Randall did not point out that equation (3) is the soly.-product law in an exact form. In sufficiently dil. solns., especially of uni-univalent electrolytes, the ion activities are approx. equal to their concns. Under such conditions concns. can be substituted for activities in equation (3), giving the ordinary form of the soly.-product law. The latter can therefore be expected to hold when the concns. are approx. equal to the activities and to fail when the concns. differ appreciably from the activities. W. G. Gaessler

Condition of strong electrolytes in concentrated solution. I. Nitrates. H. von Halban and J. Eisenbrand. *Z. physik Chem.* **132**, 401-32(1928).—The displacement of anion absorption bands in the presence of cations has been examd. in detail for the nitrate-ion band at 300$\mu\mu$, by using concd. solns. of alkali nitrates and also dil solns. of the nitrates in concd. solns. of other salts. All cations influence the absorption of the nitrate ion, which is in the same condition in a concd. nitrate soln. as in a dil. nitrate soln. having a high cation concn. The less easily deformed the cation, the greater is its influence on the anion, while the dielec. constant of the solvent is of considerable importance as regards the magnitude of the effect. The displacement of the band decreases on passing down a group of the periodic table, and in the case of the alkali metals changes sign. No influence is manifested by heavy-metal cations such as the mercuric, cupric and nickelous ions at the low concns. at which the alkali metals are active. Schäler's observation, that Beer's law is not valid for these nitrates at even low concns., is not due to a change in the absorption of the nitrate ion, but is a cationic effect. Other anions present in the soln. affect the extent, but not the nature, of the displacement. For a given concd. nitrate soln. there exists a dil. nitrate soln. contg a different salt of the same cation, such that the two solns. possess at all wave lengths identical absorption The displacement effect is discontinuous, and is due to the formation of a new type of absorbing mol which contains both the nitrate ion and the cation **II. Nitric acid.** *Ibid* 433-55.—Measurements have been made of the absorption spectrum of HNO_3 in solns. of widely varying concn. in water and in aq. solns of $HClO_4$, H_2SO_4 and H_3PO_4, and also in dil. Et ether, acetic acid, Et alc. and hexane soln. The spectra of the dil. aq. solns are identical with those of the corresponding nitrate solns. At concn. below about 10N the extinction-wave-length curves of all the aq. solns. intersect at a common point. The extreme variations exhibited by the spectrum over this concn. range cannot be ascribed to the presence of undissocd. mols. of HNO_3, and the possible formation of ionic pairs or of complex ions is suggested. In ether and in acetic acid soln., HNO_3 exists to the extent of about 60% as assocd. ions, this is the case for concd. aq. solns., the remainder consisting of undissocd. mols. The spectra of the solns. in hexane resemble those of the esters, the greater part of the acid being undissocd. Solns. in aq. H_2SO_4 have spectra which change from the first type to the second as the H_2SO_4 concn. increases. The totally different spectrum exhibited by concd. H_2SO_4 solns. of HNO_3 is ascribed to the presence of nitric anhydride.

B. C. A.

Refraction and dissociation of electrolytes. I. In water. Erling Schreiner. Oslo Univ. *Z. physik Chem.* **133**, 420-30(1928).—The mol. refraction of CCl_3CO_2H, of Li and Na trichloroacetates, and of HCl and LiCl have been measured in water. The values for the refraction of HCl and LiCl in MeOH and EtOH are given in the next paper (cf. below). The dissocn. ratio of the acid is compared with that for salts S. distinguishes dissocn. (1) $AB \rightleftharpoons A^+ + B^-$ from (2) $A^+B^- \rightleftharpoons A^+ + B^-$. If R be the refraction for electrolytes (acids) at a concn. C, R_0 the refraction at $C = 0$ and R_u the refraction of the undissocd. mol., then $(1 - \alpha) = (R_0 - R)/(R_0 - R_u)$ and the degree of dissocn. $\alpha = (R - R_u)/(R_0 - R_u)$. A difficulty of the method is that deformation diminishes refraction as the concn. increases. If the value for α agrees with the law of mass action it is most probable that the dissocn. belongs to class (1). All ordinary salts exhibit quite const. refraction even up to multimolar concns., but solns. about 2-4 N, particularly in the case of multivalent salts, must be put with the undissocd. mols. of the second class. The incompletely dissocd mol. of class (2) does not appear of significance; *i. e.*, the refraction is the sum of the free ions, a conclusion supported by the incomplete dissocn. of alk. hydroxide. A

new construction Zeiss-Pulfrich refractometer was used and values obtained for the Na_D line and the H_ϵ and H_F lines. A Sprengel pycnometer was used in the density detns. Concns. were detd. by weighing. The CCl_3CO_2H was vacuum, distd. **II. In methanol and ethyl alcohol.** *Ibid* **135,** 461–72.—The linear diminution of refraction for HCl at high concns. could not be taken as due to incomplete dissocn. either of the first kind (cf. above) or of the second kind, but must be ascribed to a deformation effect of ions upon solvent. The result can also agree with the finding that aq. HCl is for the most part incompletely dissocd and has a dissocn. const. of 10^4–10^6. The dissocn. const. of HCl in EtOH should be about 10^{-1} and the refractometric methods was used to ascertain the state of HCl in EtOH and also of LiCl in MeOH and EtOH which was used in comparison. The MeOH was dried with Mg turnings and the EtOH with CaO and Ca or amalgamated Al turnings Dryness was established by cond. measurements. LiCl was heated with abs. EtOH, the liquid treated with $(NH_4)_2CO_3$, warmed and filtered. The filtrate was acidified, taken to dryness and the NH_4 salts volatilized off. The residue was dissolved, acidified, filtered, evapd. and dried at 150°. The mol. refraction of HCl and of LiCl in MeOH was detd. at 18° for the C, D and F lines, and of LiCl and HCl in EtOH. A salt like LiCl appears completely dissocd. in water and both alcohols and a dissocn. of the second kind in media of low dielec. const. and up to about 2.5 *N* may be neglected in the alcohols. The refraction for HCl in MeOH and EtOH is linear with concn. The figures for HCl and LiCl in water, MeOH and EtOH are explicable on the assumption of monosolvation of the H ion, *i. e.*, H^+HOH, H^+CH_3OH, $H^+C_2H_5OH$ and the same for the Li ion. The refraction values for HCl and LiCl at infinite diln. fall in the order: water, MeOH, EtOH.

S. L. B. Etherton

The electrolytic dissociation of dibasic acids. IV. The dissociation constants of some mercaptomonocarboxylic acids. Erik Larsson. Lund-Univ. *Z. anorg. allgem. Chem.* **172,** 375–84(1928).—The first and second dissocn. consts. of the following acids were detd. Thioglycolic acid, 2.1×10^{-4}, 2.1×10^{-11}, α-thiolactic acid, 2.0×10^{-4}, 2.0×10^{-11}; β-thiolactic acid, 0.46×10^{-4}, 2.9×10^{-11}, α mercaptoisobutyric acid, 1.26×10^{-4}, 0.48×10^{-11}. The first dissocn. consts. were detd. from conductivities, the second from colorimetric measurements with known indicators. These are gross dissocn. consts. as both the first and second ionizations involve two dissocns., the acids being dibasic and unsymmetrical. However, L. shows that in the first stage the strength of the COOH group in the undissocd acid mol. preponderates while in the second stage of ionization the mercaptan group of the univalent acid anion is the predominating factor.

R. E. Gibson

Migration of ions from aqueous solutions into glass. Franz Quittner. *Ann. Physik* [iv] **85,** 745–69(1928).—The migration of cations from metal salt solns. and of H ions from acid solns. into 4 Schott glasses at 52° and $2 - 6 \times 10^5$ volts/cm field strength has been investigated. The percentage of the total current carried by alkali metal ions is characteristic for the various glasses and rises with increasing concn of the soln. used as anode. Ag ions wander the most freely, while Ca, Ba, Zn and Cu, when at all, wander only feebly. With an acid soln. or a $Ba(OH)_2$ soln. as anode, the current for the greater part is due to H ions.

B. C. A.

Electrical conduction in solutions, and the determination of electrical conductivity. K. Sándera. *Listy Cukrovar.* **47,** 9–14(1928).—Problems are given to illustrate the effect of size and shape of cond. cells upon the course of elec. conduction so that abnormal and disturbing effects encountered in the practical application of elec. cond. measurements may be predicted and avoided.

Frank Maresh

The role of phosphates in the oxidation of glucose. A. N. Kappanna. *J. Indian Chem. Soc.* **5,** 387–96(1928).—The oxidation of *glucose* by *iodine* to *gluconic acid* takes place in alk. soln. The reaction rate at 22° increases with increasing p_H. In neutral solns. and in a phosphate soln. buffered to $p_H = 7.0$, the reaction does not occur. At const. alky. the rate is independent of the phosphate concn. Results indicate that no hexose-phosphate complex is formed. In the *decompn. of H_2O_2* in water at 60° the results indicate that no phosphate-H_2O_2 complex is formed. The rate of decompn. at const. alky. is independent of the phosphate concn. The velocity increases with increasing p_H.

Paul J. Culhane

The nitronium or nitracidium salts and the cationic wandering of nitric acid. A. Hantzsch and Kurt Berger. *Ber.* **61B,** 1328–34(1928).—The nitracidium ion is that such as is formed by the interaction of abs. $HClO_4$ and HNO_3 to form $[O_2NOH]^+$ and $[N(OH)_3]^{++}$. The cond. of nitracidium perchlorate is detd. in abs nitromethane as a binary electrolyte. The molar cond. is a min. at $v = 120$, corresponding to $\mu_v = 14$; $\mu_\infty = 135$. Similarly the hydronitracidium perchlorate

$[NO_3H_3](ClO_4)_2$ is a ternary electrolyte; the value of $\mu_\infty = 200$. This proves the cationic wandering of HNO_3 as nitracidium, especially in pure nitromethane, which is further demonstrated by analysis of cathode liquid in a migration app. G. L. C.

The constitution of acids and salts and their chemical changes in solution. A. HANTZSCH. *Z. physik. Chem.* **134**, 406–12(1928).—The usual distinction between pseudo acids, *e. g.*, $XO_2 \cdot OH$, and true acids, XO_3H, is meaningless inasmuch as the latter do not exist. Liquid oxygen acids exist as $XO_2 \cdot OH$ or an associated form of this and are changed by water to an oxonium salt, $[XO_3]H_3O$. H. redefines the term acid and mentions methods for detg. the degree of acidity. Salts may exist as true or pseudo salts; the latter class includes the salts of the heavy metals. LUCY K. PICKETT

The chemical changes of acids and salts in solution on the basis of refractometric data. A. HANTZSCH AND F. DURIGEN. *Z. physik. Chem.* **134**, 413–52(1928).—The paper is a discussion of exptl. results. The mol. refraction is a measurement of the space occupied by the mol.; hence its changes may be ascribed to a deformation of the electron system due to either physi al or chem. changes. The shifting of the refraction of acids and salts in soln. is primarily caused by chem. change. The refractive power of an acid is raised in the change of a pseudo acid to its hydroxonium salt (cf. preceding abstract) and lowered in the hydration of the latter. True salts show only the second effect if any, while pseudo salts should show both. The behavior of nitric acid at high concns is ascribed to a change from nitronium nitrate to the pseudo acid. The agreement of results obtained by refraction and light absorption methods, supplemented by cond. data, is discussed. *Ibid* **136**, 1–17(1928).—The exptl. results obtained by the authors and other investigators for the mol. refraction of aq. and alc solns. of various concns. are tabulated for the following acids and their salts. $HClO_4$, HCl, HBr, HI, HNO_3, H_2SO_4, HCOOH, CH_3COOH, CH_3CH_2COOH, $CH_2ClCOOH$, $CHCl_2COOH$, CCl_3COOH, $CH_2BrCOOH$, $CH_3CHBrCOOH$, $C_6H_5SO_3H$.
LUCY K. PICKETT

Quantum statistics applied to irreversible reactions. TH. DE DONDER. *Bull. sci acad roy Belg.* **14**, 135–9(1928); cf de Donder, *Ibid* **13**, 303(1927).—A mathematical treatment of a previously considered irreversible reaction using the recent results of Brillouin, *Ann. phys.* **7**, 315(1927) and Bothe (*C. A.* **22**, 1890).
ARTHUR FLEISCHER

The influence of salts on the solubility of other salts in non-aqueous solutions. CHARLES A KRAUS AND RALPH P. SEWARD Brown Univ. *J. Phys. Chem.* **32**, 1294–1305(1928) - The solubilities of NaBr in the presence of $NaNO_3$ in Me_2CO, NaCl in the presence of $NaNO_3$ and NH_4NO_3 in Me_2CHOH and of NaCl in the presence of $NaNO_3$ in hydrated Me_2CHOH were measured at 25°. The soly effects in these solvents resemble those in H_2O, *i e*, the soly of a given salt is depressed by the addn. of a second salt with a common ion and is increased by the addn of a second salt without a common ion. The soly. depression in these solvents is about 1/4 that in H_2O, while the increase on addn. of a salt without a common ion is about 4 times as great as that in H_2O. The observed effects are much smaller than those predicted by the interionic attraction theory of Debye and Hückel. It is suggested that, in solvents having dielec consts of intermediate values, electrolytes are incompletely ionized. The idea of interionic attraction should be supplemented by other assumptions, such as the nearness of approach of the ions and the spatial configurations of their electronic systems.
H. F. JOHNSTONE

The kinetics of oxidation of organic substances with bromine. I. Effect of bromine on oxalic acid. EDWARD JÓZEFOWICZ. *Roczniki Chem.* **8**, 123–51(1928).—At 20° in 1/20 to 1/80 *N* soln. the reaction is detd. by: $dx/dt = K_0(a-x)^2/x^2$. Br_2 apparently reacts not with the undissocd. mol., but with the anion; hence the reaction velocity is increased by diln., by the progress of oxidation and by the addn. of Na_2SO_4 and decreased by HBr, bromides, HNO_3, HCl. For HBr: $dx/dt = K_0(a-x)^2/(c+x)^2$, for bromides: $dx/dt = K_0(a-x)^2/(^3/_5c+x)^2$ and for HCl and HNO_3: $dx/dt = K_0(a-x)_2/(^1/_5\ c+x)^2$. Chlorides have no perceptible effect. The temp. coeff. is 4.52 between 10° and 20°. The oxidation of *acid oxalates* by Br_2 follows the same equation, but dx/dt is 3 times higher For *neutral oxalates* dx/dt is too high to permit any kind of measurement. Previous authors have assumed that Br_2 reacts as such with $C_2H_2O_4$ and that Br^- forms with Br_2 Br_3^- which takes no part in the reaction. This, however, would mean a reaction of 2nd order, while it actually is of 0 order. It also would call for an inhibition of the reaction by Cl^-, since they are capable of binding Br_2 to $ClBr_2^-$, while the reaction is less inhibited by HCl than by HNO_3 and even slightly accelerated by chlorides. If, however, we assume that $C_2O_4H^-$ reacts with HOBr formed by hydrolysis from Br_2 we obtain for dx/dt the equation found exptly

This theory, however, does not account for the greater effect of Br^- over H^+. Possibly $C_2O_4^{--}$ also reacts according to Roloff, but in view of the slight dissocn. of $C_2O_4H^-$ this reaction can be only of secondary importance. MARY JACOBSEN

The solubility of potassium ferricyanide in water between 0° and 100°. JOHN A. N. FRIEND AND WM. N. SMIRLES. Techn. College, Birmingham, Eng. *J. Chem. Soc.* **1928**, 2242–5.—Contrary to the results of Vallance (*C. A.* **21**, 3297), the authors do not find a break in the soly. curve of $K_3Fe(CN)_6$ in H_2O between 0° and 100°. The soly. in g. per 100 g. of H_2O is given by the equation, $S = 30.4 + 0.80t - 0.0020t^2$. The ds. of the satd. solns. at various temps. were also detd. The d. curve also shows no irregularity. H. F. JOHNSTONE

The solubility equilibrium of crystallized zinc hydroxide in sodium hydroxide. R. FRICKE AND H. HUME. *Z. anorg. allgem. Chem.* **172**, 234–42(1928).—The previous work on the soly. of amphoteric hydroxides in solns. of strong alkalies done by Fricke and his collaborators and by other investigators is reviewed. Additional work with data is presented to show the variation of soly. of $Zn(OH)_2$ with the concn. of alkali, excess of solid $Zn(OH)_2$, and time of contact. Gravimetric and volumetric methods for the analysis of this type of soln. and the probable formulas of the possible Na zincates are discussed. W. J. SWEENEY

Solubility relations of isomeric organic compounds. VIII. Solubility of the aminobenzoic acids in various liquids. CHARLES L. LAZZELL AND JOHN JOHNSTON. Yale Univ. *J. Phys. Chem.* **32**, 1331–41(1928).—The solubilities of each of the 3 aminobenzoic acids from 25° to its melting temp. have been detd. in benzene, $CHCl_3$, EtOH and EtOAc. A few detns. in MeOH and BuOH were made and related to those in EtOH. The results are compared with data from the literature on other mono-substituted benzoic acids and on the nitroanilines. Irregularities in these correlations indicate that solubilities of closely related compds. are influenced both by solvent and solute. W. T. RICHARDS

Mechanism of oxidation processes. XIV. Activation of oxygen by iron. HEINRICH WIELAND AND WILHELM FRANKE. Bayr. Akad. Wissenschaften zu München. *Ann.* **464**, 101–226(1928); cf. *C. A.* **22**, 2574.—The autoxidation of solns. of ferrous salts has been studied with AcONa and AcOH as a buffer. Absorption of O follows the unimol. law. The temp. coeff. of the process is normal, while a change from p_H 5 to 7 accelerates the reaction 4 or 5 times. At p_H 5, neutral salts have little effect on the rate of autoxidation, although Na_2SO_4, possibly because it produces complex salts, causes diminution of the reaction velocity to 0.5 its previous value. The rate of autoxidation of slightly hydrated $FeCl_3$ is greater in Me_2CO than in EtOH or iso-PrOH, greater in these solvents than in MeOH and least in H_2O. The autoxidation of a no. of acids in the presence of Fe salts has been studied. In general $FeSO_4$ is the added Fe salt and an acetate buffer is used. *Formic acid.*—Autoxidation of the ferrous salt induces autoxidation of formate, the latter ceasing when no more ferrous salt remains, since ferric Fe does not oxidize HCO_2H. *Lactic acid*—Autoxidation of the lactate is more rapid than that of the formate, about $^1/_3$ of the O absorbed by the system during the complete oxidation of the Fe being used to oxidize the lactate to CO_2, AcH and (some) pyruvic acid. Autoxidation is most rapid at p_H 8.0 and is slower in air than in pure O. *Pyruvic acid.*—This case is very similar to that of lactic acid: in neither case does ferric Fe oxidize the acid. *Tartaric acid.*—This autoxidation is investigated very fully. Small changes in conditions very greatly affect the progress of the reaction. Ferric salts do not initiate autoxidation of tartaric acid but play a considerable part in the autoxidation of the acid in the presence of ferrous salts, since the dihydroxymaleic acid (I) formed is oxidized by ferric, producing ferrous salts The autoxidation proceeds much further in acid than in neutral solns. and has a normal temp. coeff. up to 20°. At 30°, however, the process is not appreciably quicker than at 20°. To some extent, the process is catalytic in nature, because of the reduction of ferric salts by the I formed. I acts as a strong positive catalyst for a similar reason The autoxidation process is greatly accelerated by Na_2SO_4 and somewhat accelerated by $NaNO_3$ or by $CuSO_4$, while NaCl, NaI and NaBr act as strong retardants. *p*-$C_6H_4O_2$ also has a retarding effect. Increased pressure of O accelerates autoxidation, but the total amt. of O used is less than is the case with lower pressures. *Dihydroxymaleic acid.*—Because of the slight soly. of the K and Na salts of I, buffering is best effected by AcOH and AcOLi. The spontaneous decompn. of a buffered soln. (p_H 4.8) of I (atm. of N) is markedly affected by ferrous salts. Substitution of phthalate for acetate as a buffer has only a slight effect. Phosphate produces marked retardation and addn. of pyrophosphate in addn. further retards the velocity of autoxidation. Buffering with glycine causes acceleration. At p_H 1.4 and 13, autoxidation is markedly

slower than at intermediate acidities, p_H 5 being the optimum condition. The spontaneous autoxidation of I in the absence of Fe proceeds more rapidly in alk. than in acid soln. The main reaction involved is I + $^1/_2$ O_2 $\longrightarrow$ $HO_2CCOCOCO_2H$. Ferric salts oxidize I (p_H 5, AcOH and AcOLi) to diketosuccinic acid, which, during the autoxidation process, gives $(CO_2H)_2$ and mesoxalic acid in the ratio of 1 : 2, the latter slowly giving $(CO_2H)_2$. *Glyceric acid.*—This case is similar to tartaric acid. Added ferrous salt produces an effect roughly proportional to its concn. *Thioglycolic acid.*—Cu salts are in general more positively catalytic of the autoxidation of this acid than are those of Fe, but the latter become more effective in the neighborhood of the neutral point. H_2SO_4 is a product of autoxidation, which is retarded by cyanides. *Hydroquinone.*—The oxidation of this compd. by ferric salts renders the autoxidation of hydroquinone in the presence of ferrous salts similar to that of I. The velocity of change depends very largely on the p_H. Near the neutral point, ferrous salts reduce p-$C_6H_4O_2$ so that the basis of the autoxidation process is $HOC_6H_4OH + 2Fe^{\cdot\cdot\cdot} \rightleftharpoons O{:}C_6H_4{:}O + 2Fe^{\cdot\cdot} + 2H^{\cdot}$. The buffer used may have a considerable effect on the mobility of the equil. Thus, autoxidation is particularly facile in the presence of a AcONa buffer, less so with Na glycerate and much less so with Na phthalate. The catalytic action of Fe salts in this process has its optimum within certain fairly narrow limits of concn. p-$C_6H_4O_2$ has a marked retarding effect on the autoxidation of hydroquinone, probably owing to the formation of an inactive Fe-quinhydrone complex. It is difficult to recognize the mechanism of the autoxidation as one of true catalysis and it may be that ferric salt is the effective oxidant of the hydroquinone. This would explain why in the slow autoxidation of hydroquinone that occurs in the absence of a buffer, ferrous and ferric salts produce effects of a similar magnitude. In buffered solns., ferrous Fe is more powerful in action than ferric, so that probably an O activation process is at work, in this case, on the part of a ferrous salt-acetate complex. *Pyrocatechol.*—Here the accelerative influence of Fe in autoxidation is markedly stronger than with hydroquinone. *Pyrogallol.*—This case is similar to pyrocatechol, but autoxidation is more rapid The product is not purpurogallin but is the amorphous brown substance, resembling a humic acid, obtained in the H_2O_2-Fe oxidation of pyrogallol $K_4Fe(CN)_6$ aids autoxidation but to a much smaller extent than simple Fe salts. Expts. have been carried out on the autoxidation of I in complete absence of Fe salts, to see if the known absorption of O by solns. of I is really due to the presence of unsuspected traces of Fe. While special purification of I (vacuum distn. in quartz) renders it more stable in this respect, Fe is not the initiator of the process but merely catalyzes a reaction in progress. This is supported by the fact that, in neutral solns. of the purified material, cyanide slightly accelerate autoxidation, whereas in the presence of traces of Fe, it markedly diminishes the acceleration due to the latter. Similar results have been obtained with hydroquinone. The autoxidation of hydroquinone itself produces H_2O_2 at p_H 3.6, while when Fe is present no H_2O_2 is formed. *Arsenious acid.*—According to Manchot (*Z. anal. Chem.* **27**, 420(1901)) 1 equiv. of O is activated during the oxidation of $Fe^{\cdot\cdot}$ to $Fe^{\cdot\cdot\cdot}$ and is used for the conversion of arsenite to arsenate. This is not actually realizable under all conditions of acidity. The most concd. weakly alk. soln. (p_H 6) of arsenite obtainable shows an activation of only 0.88 equiv. For p_H 10, corresponding with $NaAsO_2$, activation corresponds to 0.6 equiv. and for more strongly alk. solns., corresponding with Na_2HAsO_3, it corresponds with not more than 1 equiv., in opposition to Gire's results (*C. A.* **14**, 3027). When alky. corresponds to Na_3AsO_3, activation exceeds 1 equiv. of O, the extra (0.5 mol.) activation being due to spontaneous autoxidation and not to oxidation of arsenite by ferric salts. *Hypophosphorous acid.*—This acid is not appreciably oxidized by O in the absence of Fe salts. The autoxidation in the presence of Fe salts seems to be an induction effect, ceasing when all ferrous salt has become oxidized. It is little affected by p_H. The results appear to show that the activation of mol. O by ferrous salts cannot be due to the intermediate formation of a peroxide, as suggested by Manchot. It is probable that the 1st stage in the autoxidation is the formation of a complex between the ferrous salt and the hypophosphite, rendering the H of the latter more active as regards oxidation. The 2nd stage is the very slow reaction $2Fe^{\cdot\cdot\cdot} + H_3PO_2 \xrightarrow{H_2O} 2Fe^{\cdot\cdot} + H_3PO_3 + 2H^{\cdot}$. H_3PO_3 behaves similarly to H_3PO_2 but the activation is less pronounced and is more influenced by the acidity conditions. Certain combined autoxidations have been studied. The autoxidation of H_3PO_2 in the presence of ferrous salts and I is catalytic in type, the p_H of the soln. not greatly affecting the rate of change. Diketosuccinic acid (not tartaric or glyceric acid) behaves similarly to I but it is only slowly oxidized by ferric salt, whereas the latter is instantaneously oxidized by ferric salt in the presence of H_3PO_2. The mech-

anism of the combined autoxidation is discussed. Possibly a readily dehydrogenated ferric salt-diketosuccinic acid complex is formed as an intermediate. The autoxidation of HCO_2H in the presence of ferrous salts is accelerated by I but the acceleration is less than in the above case of H_3PO_2. Diketosuccinic acid is again an active intermediate. Relatively large amts. of I are required to produce acceleration and the same is the case in the autoxidation of lactic acid in the presence of ferrous salts. I produces no acceleration of the autoxidation of hydroquinone-ferrous salts. The autoxidation of HCO_2H-ferrous salt in the presence of thioglycolic acid is similar to the above case of HCO_2H-I The acid does not accelerate autoxidation until present in a certain concn. but after this is reached its effect is proportional to its concn. When lactic acid replaces HCO_2H there is a more pronounced mutual activation, while when tartaric acid is used, less thioglycolic acid is required to accelerate the (more rapid) autoxidation. The autoxidation of H_3PO_2 and ferrous salts in the presence of thioglycolic acid is a case of true catalysis, due to the equil. between $Fe^{\cdot\cdot}$-thioglycolic acid and Fe -dithiodiglycolic acid. This equil. must lie mostly on the $Fe^{\cdot}$ side, because of the marked initial activation which precedes the main, catalytic, stage. Activation is ascribed to the formation of a thioglycolic acid-ferrous salt complex. The autoxidation of H_3PO_2 in the presence of ferrous salts is not accelerated by pyruvic acid but the autoxidation of pyruvic acid in the presence of H_3PO_2 is markedly accelerated by traces of ferrous salts, giving a case of true catalysis. Some consideration is given to cases of direct addn. of O to an unsatd. linking, as distinguished from the above cases, in which H is removed from a substance. The autoxidation of linolenic acid and of lecithin is also discussed. C. J West

Velocity coefficients for bimolecular reactions in solutions. D. H. Peacock. *Nature* **122**, 131–2(1928).—A discussion of energy exchanges between solvent mols and mols. of a reacting solute; activated mols. (*C. A.* **22**, 1518, 2506). P. raises the question of electron tautomerism in this connection. G R Yohe

Solubility of alkali soaps in hydrocarbons. Josef Weichherz. Tierärztliche Hochschule, Berlin. *Naturwissenschaften* **16**, 654(1928) – It was found that highly viscous or gelatinous solns of alkali soaps in hydrocarbons can be made; small quantities of PhOH, alcohols and water promote the soly. At normal temps the soaps swell slightly, more at high temps., in hydrocarbons. At high soap concns the formation of water-in-oil emulsions was observed, reversing to oil in-water on lowering the concn No details are given. B J. C. van der Hoeven

The chemical reactions of carbon monoxide and hydrogen after collisions with electrons. A. Caress and E. K. Rideal. *Proc Roy. Soc.* (London) **A120**, 370 8. (1928); cf. *C. A.* **21**, 3548.—The method used in this study was a previously published one with some improvements. The rates of the reaction at various voltages with const electron current and efficiencies were detd For pure CO the main reaction 2CO → C + CO_2 occurred above the arcking potential A small quantity of C_3O_2 was probably formed. With equimol. mixts. of CO and H_2 decrease in pressure was always observed even with a zero voltage when the filament temp. was high enough. The reaction of H atoms with CO ions was more rapid than that between the atom and mol. H ions did not appreciably enhance the speed. In the products of reaction no CH_4, H_2O, C or CH_3OH was found. When the tubes were allowed to warm to room temp. the pressure decreased following a unimol law and a white solid deposited on the walls. This reaction was the polymerization of liquid formaldehyde to trioxymethylene. For every ion formed more than 1 mol. of CO reacts so that some kind of chain mechanism must be operative in the reaction. Arthur Fleischer

Surface solutions. R. Delaplace. *J. phys. radium* **9**, 111–9(1928).—An app is described for measuring the pressure and area of surface solns., and the pressure-area temp. relations of surface solns. of benzyl benzoate are examined at pressures of 0 1 0.001 dyne/cm, and at 15° and 27°. The laws of Boyle, pS = const., and of Gay Lussac, $pS = kT$, where p is the surface pressure, S the area of the surface, and k a const., were verified. The value of k is much smaller than that of R, the gas const Attention is directed to the difference in exptl. conditions between D.'s work and that of Adam and Jessop (*C. A.* **20**, 1542, 1544). B. C. A

Velocity of ionic reactions. III. R. N. J. Saal. *Rec. trav. chim.* **47**, 385 96 (1928).—By the oxidation-potential method previously described (*C. A.* **22**, 1263, 1714), the velocity coeff. of the bimol. reaction between ferrous and persulfate ions has been detd. in different concns. of KCl, $MgCl_2$ and $MgSO_4$. Practically the same values were obtained with equiv. concns. of excess of neutral salt. This is not in accordance with theory and might be ascribed to the accelerating influence of the Mg ion. It is shown that the catalytic influence of Fe salts on the reaction between per-

sulfate and I, observed by von Kiss and von Zombory (*C. A.* **21**, 2593), cannot be wholly explained by the reactions $2Fe^{\cdot\cdot} + S_2O_8'' \longrightarrow 2Fe^{\cdot\cdot\cdot} + 2SO_4''$ and $2Fe^{\cdot\cdot\cdot} + 2I' \longrightarrow 2Fe^{\cdot\cdot} + I_2$. The amt. of I formed by catalysis, as calcd. from the coeff. of these reactions, is much smaller than that found by expt. The velocity coeff. of the bimol. reaction $I_2 + Fe(CN)_6''''$ has been detd. in the presence of 0.1 and 1 *N* KCl, and the latter is found to have a strong retarding action which is not in accordance with Brønsted's theory. B. C. A.

The theory of the acid-base function. J. N. Brønsted. *Ber.* **61B**, 2049–68 (1928).—An acid is defined as a compd. which can lose a proton, while a base is a compound which can add a proton. The acid-base function and the hydration effect believed to exist are explained. The strength of acid and base in benzene may be explained also with the above definition. Equil. consts. and their significance are discussed. The following acids arranged as to the order of their strength in benzene have been studied: HCl, methyl red, dimethyl yellow, CCl_3CO_2H, $CHCl_2CO_2H$, picric acid, o-nitrobenzoic acid, CH_2ClCO_2H, salicylic acid, bromophenol blue, β-dinitrophenol, *o*-chlorobenzoic acid, neutral red, *m*-chlorobenzoic acid, bromoresol green, benzylammonium ion, formic acid, phenylacetic acid, BzOH, AcOH, isoamylammonium ion, bromocresol purple, piperidinium ion and bromothymol blue. Raymond H. Lambert

Hydrolysis in solutions of potassium laurate as measured by extraction with benzene. James W. McBain and Monroe Eaton. Stanford Univ. *J. Chem. Soc.* **1928**, 2166–79.—The compns. of C_6H_6 solns. of lauric acid in equil. with various solns. of K laurate at 25° were detd. Unaltered soap solns. contain a slight trace of free fatty acid—a small percentage of the amt. which can be dissolved in water. The fatty acid which corresponds to the hydrolysis alky. is almost quantitatively combined as acid soap. An acid soap in the form of sediment is produced when CO_2 is in contact with soap solns. K laurate, both solid and in aq. soln., extracts lauric acid from its concd. solns. in C_6H_6, forming acid soap. The existence of a definite cryst. compd. (acid potassium laurate, KL.HL), sol. in hot C_6H_6, is shown. Soap is almost quant. removed by a concd. soln. of lauric acid in C_6H_6. The presence of salts promotes the formation of acid soap, but diminishes the extractability of aq. soap soln. A. J. Currier

The decomposition of hydrogen peroxide in the presence and the absence of sodium hydroxide. Constantin Pana. Muspratt Lab. of Physical and Electro-Chem., Univ. of Liverpool. *Trans. Faraday Soc.* **24**, 486–92(1928).—The decompn. of H_2O_2 was detd. for 0.5 and 1.5 *N* solns. at 40°, 50° and 60° in aq. and in 0.008, 0.013 and 0.025 *N* NaOH solns. in freshly blown glass, wax-covered glass and silica containers. The results in wax were taken as due to the dust in the soln. and these values were subtracted from the values in glass and silica to get the true values for those surfaces. NaOH lowers the critical increment while raising the initial velocity of decompn. With increase in H_2O_2 concn. the critical increment increases and the velocity of decompn. diminishes. In the presence of alkali increasing $Fe(OH)_3$ concn. lowers the rate of decompn. A pos. catalytic effect may be ascribed to the hydroxyl ion. A. F.

The reciprocal couple: $2NaCl + Ba(ClO_3)_2 = 2NaClO_3 + BaCl_2$. C. Di Capua and A. Bertoni. R. Univ. di Firenze. *Gazz. chim. ital.* **58**, 249–53(1928).—Isotherms of the systems: $NaClO_3$–$NaCl$–H_2O, $NaCl$–$BaCl_2$–H_2O, $BaCl_2$–$Ba(ClO_3)_2$–H_2O and $Ba(ClO_3)_2$–$NaClO_3$–H_2O are given in tables and diagrams for 20°. From these data it is shown that at 20° $Ba(ClO_3)_2$–NaCl is the stable couple. Further data in diagrammatic form show the compn. in g.-equivs. of quaternary solns. C. C. D.

Reactions between carbon monoxide, carbon dioxide and hydrogen in a "cold-warm" tube at atmospheric and high pressures. F. Fischer and F. Wangenheim *Brennstoff-Chem.* **9**, 94–7(1928).—A *special steel bomb* is used in which the contact metals serve as elec. resistors. Metals used were: Fe, Ni, W, Mo and also C, named in order of their catalytic activity. Various mixts. of CO and CO_2 with H_2 were used. C was produced, and also CH_4, with traces of higher homologs in some cases. Traces of HCHO were formed, but no CH_3OH. Temps. of 550° to 800° were used. J. D. D.

Some gas reactions in a "cold-warm" tube. F. Fischer and F. Wangenheim. *Brennstoff-Chem.* **9**, 97–8(1928).—App. designed (cf. preceding abstr.) to investigate catalytic reactions of mixts. of CO and H_2 was used with Fe as a catalyst. Mixts. of CO, CO_2, H_2O and CH_4 were investigated at 600–700° and up to 6 atm. CH_4 remained practically unchanged. Reactions taking place were: (1) $2CO \longrightarrow CO_2 + C$ and (2) $CO + H_2O \longrightarrow CO_2 + H_2$. J. D. Davis

Measurement of hydrolysis in stannous salt solutions. Milda Prytz. Copenhagen. *Z. anorg. allgem. Chem.* **174**, 355–75(1928).—The solns. used were prepd. in an atm. of H and great care was taken in the work to prevent the formation of any

stannic salt. A series of potentiometric titrations of stannous salt solns. with NaOH was carried out at 25°. The results are presented graphically in a series of curves. The first portion of each curve corresponds to the neutralization of the free acid present; the second portion (a vertical line) to the formation of a basic ppt., probably $Sn(OH)_2$; the third portion, obtained when the NaOH added is about 2 equiv. per atom Sn, is again an ascending curve. On the assumption that hydrolysis proceeds in such a way that the $Sn(OH)^{\cdot}$ ion goes over into $Sn_2(OH)_2^{\cdot\cdot}$ or $Sn_2O^{\cdot\cdot}$, the hydrolysis const. $K = (\alpha^3/(1-\alpha)^2)m$, where m = molar concn. of stannous salt and α = degree of hydrolysis. The following values of K were found: 0.08×10^{-3} for $SnCl_2$ contg. 0.5 M KCl; 2.0×10^{-3} for $SnCl_2$; 0.58×10^{-3} for $SnBr_2$ contg. 0.5 M KBr; 8.3×10^{-3} (value uncertain) for $SnBr_2$; 1.8×10^{-3} for $Sn(ClO_4)_2$. The soly. product of $Sn(OH)_2$ was found to be about 5×10^{-26}. The decrease in concn. of the stannous ions was followed by means of a titration in which a Sn electrode was used in place of the usual H electrode. The results agreed well with those to be expected according to the other calcns. At the OH^- concn. used there was apparently no formation of stannite. LOUISE KELLEY

Decomposition of water and aqueous chloride solutions by iron powder. STANISLAW MICEWICZ. *Przemysl Chem.* **11**, 501–11(1927).—Rates of evolution of H_2 by Fe powder added to water and aq. solns. of NaCl, KCl, $CaCl_2$ and $MgCl_2$ at 100° and a little higher were measured. NaCl and KCl diminish this rate, $CaCl_2$ increases it a little, and $MgCl_2$ increases it very much. In this last case some Mg is pptd. as the oxide or hydroxide, and some Fe remains in soln. Nitrobenzene was reduced by heating on a water bath a mixt. of a soln. of $MgCl_2$ with $C_6H_5NO_2$ and Fe powder. $(C_6H_5NH_2)_2MgCl_2.6H_2O$ forms as a gelatinous ppt. It is refluxed to disappearance of $C_6H_5NO_2$, dild. with water, treated with alkali and $C_6H_5NH_2$ is steam-distd. A. C. ZACHLIN

The theory of acidity. LOUIS P. HAMMETT. Columbia Univ. *J. Am. Chem Soc.* **50**, 2660–73(1928).—A generalized theory of acidity is proposed and given mathematical expression In this the effect of basicity and of the dielectric const. of the solvent are both considered. The predictions of the theory are in agreement with the available evidence in non-aq. soln., notably with the work of Hantzsch and with that of Hall and Conant. R. H LOMBARD

The homogeneous reaction between hydrogen and oxygen. C. H. GIBSON AND C. N. HINSHELWOOD. Oxford. *Proc. Roy. Soc.* (London) **A119**, 591–606(1928) The combination of H and O between 500° and 600° has been studied by a static method in porcelain vessels. Above 500° a homogeneous reaction of high and somewhat variable order becomes manifest; the temp. coeff. is high, and the reaction at higher temps. is retarded by increasing the surface exposed to the gases The rate is approx. proportional to the cube of the H-ion concn and to a power of the O concn. which is greater than unity. The reaction is much accelerated by steam, but the action of steam is not autocatalytic in the ordinary sense since gases like He, N_2 and A have a somewhat similar effect. The results are interpreted on the assumption that reaction chains are propagated through the gas. These chains are broken by deactivation of mols in a heterogeneous reaction at the walls of the vessel, and lengthened by the presence of inert gases, which increase the time during which mols. escape contact with the walls The order of the diffusion coeff. of the inert gas may be correlated with its effectiveness O and H may themselves have an "inert gas effect" in addn. to their concn.-effect influence on the reaction. Collisions of activated O mols. with mols. of inert gases appear to be elastic. The nature of the chain reactions involved is discussed. W. T. RICHARDS

The mechanism of chemical change. I. Promotion and arrest of the mutarotation of tetraacetylglucose in ethyl acetate solution. T. MARTIN LOWRY AND G. GLYN OWEN. *Proc. Roy. Soc.* (London) **A119**, 505–22(1928).—The effect of very small amts of impurities on the velocity of the mutarotation of tetraacetylglucose in AcOEt soln has been studied with very pure materials and carefully cleaned and dried vessels. It was found that the mutarotation could be retarded for several days in a SiO_2 flask which had been heated to redness, after cleaning, and then cooled in a desiccator over P_2O_5. The velocity of mutarotation of the soln. when added to a freshly cleaned and dried (not heated to redness) SiO_2 polarimeter tube was such that the $^1/_2$ change period was from 0.25 to 0.4 day, but if the tube was rinsed with the soln. first this period was increased to 20 days. Addn. of 0.3% H_2O to the soln. increased, but slightly, the initial velocity of mutarotation, which soon returned to the original value, showing that H_2O is not a catalyst for this reaction. One drop of 0.1 N HCl added to the soln. caused a rapid increase in mutarotation. A similar result was obtained with one drop of N NaOH. The mutarotation curves for the latter two cases are inflected instead of

uni-molecular as if the action had been resolved into 2 consecutive stages. Rinsing the polarimeter tube with pure solvent after the expt. with NaOH did not remove the catalyic effect on the soln. so that it appears possible that this is a surface phenomenon.
A. J. King

The rate of solution of zinc in sulfuric acid under pressures up to 347 atmospheres. Thos. C. Poulter and Glen E. Frazer. Ia. Wesleyan Coll., Mt. Pleasant. *Proc. Iowa Acad. Sci.* **34,** 215(1927).—A study was made of the factors influencing the rate of soln. of Zn in H_2SO_4. The conditions of the surface, the local concn. of the acid at the surface of the Zn, and the size and shape of the pieces of Zn were found to be very important factors, while pressures up to 347 atm. have very little direct influence upon the rate of reaction.
W. G. Gaessler

A study of the reactions involved in a system of zinc and sulfuric acid under pressures up to 16,000 atmospheres. Thos. C. Poulter and Glen E. Frazer. Ia. Wesleyan Coll., Mt. Pleasant. *Proc. Iowa Acad. Sci.* **34,** 216(1927).—A continuation of the investigation described in the previous paper. A method has been worked out for following the rate of the reaction at very high pressures in which the pressure can be varied rapidly and the rate of the reaction continuously read. Very little effect upon the rate of the reaction, directly due to pressure, was noticed up to pressures of 6000 atm.
W. G. Gaessler

Development of the concepts concerning the nature of electrolytes. F. Foerster. *Z angew. Chem.* **41,** 1013-21(1928).—A lecture tracing the development of the theories of electrolytes from the time of Arrhenius's paper on ionization (1885) to the present concepts of Bohr, Lewis, Sommerfeld and others. Electrons and nuclei, shells and charges, polar and non-polar compds., Ostwald's law of diln., the solv. product, activity coeffs., osmotic coeffs., cond. coeffs., complex salts, lattice patterns in crystals, hydrates, electrodynamic hydrates, NH_3 system of electrolytes, solvates, etc., come in for crit. reviews. "Our present progress lies in the replacement of such a puzzling process as that of electrolytic dissocn. by a new and unitary concept concerning equil. between ions, on the one hand, and, on the other, between ions and the products formed from them. It is supported upon our knowledge of the nature of ions, of the efficiency of interionic forces, of the dipolar nature of the mols. of solvents, of the deformation of the electronic paths of the ions, and an insight into the arrangement of the ions in a crystal These new ways of thinking and of investigating supplement in a welcome way the older ideas of cond., and of the osmotic and electromotive behavior of electrolytes. Quantitatively, however, we can treat only the limiting simplest systems—the most highly dild. solns. of strong electrolytes and the weakest ionized solns. of weak electrolytes; in our judgment of the complicated systems of strong electrolyte solns. and melts we depend largely upon our fancy......"
W. C. Ebaugh

The question of strong electrolytes. A. Gyemant. *Physik. Z.* **29,** 289-93(1928).—Measurements of the cond. of strong electrolytes in very poorly conducting org. solvents are in agreement with the assumption of incomplete dissocn. of strong electrolytes. Equations derived on the basis of this assumption satisfy the exptl data. In such solns. the Wien effect, *i. e.*, the dependence of the cond. on the field strength (cf. *C. A.* **22,** 3084) was demonstrated. However, the cond. transverse to the field strength was const. It is concluded that undissocd. ion pairs are only loosely combined and can contribute to the total cond. when the field strength is large.
E. R. Smith

The question of strong electrolytes and the dependence of the conductivity on potential. Georg Joos. *Physik Z.* **29,** 570(1928).—J. comments briefly on the work of A. Gyemant in relation to the Wien effect (cf. preceding abstract). R. L. H.

Dielectric constant of aqueous solutions of sodium chloride. Arthur Bramley. Bartol Foundation. *J. Franklin Inst.* **205,** 649-58(1928).—An interferometer method, depending on electrostriction produced in a soln. by an applied elec. field, has been used to det. the dielec. const. This obviates the difficulty of measuring the capacity of a cell with an appreciable cond. According to Debye and Hückel, $D = D_0 (1 - \alpha y)$, where D_0 is the dielec. const. of the solvent, α a const. depending on the types of ions present in the soln. and y the concn. of the soln. in moles per l. D. and H. found α = 6.6 for NaCl. B. finds for small concns. $\alpha = 7.85$. At higher concns. $D^2 = D_0^2 (1 - \alpha' y)$ and $\alpha' = 15.7$. A max. error of 4% is claimed. The theoretical background of the method is discussed.
W. T. Richards

Determination of partition coefficients for ions. Ernst Allemann. Inst. für physikal. Chem. der E. T. H. Zürich. *Z. Elektrochem.* **34,** 373-87(1928).—The phase-boundary potential between an aq. soln. of an electrolyte, MR, and a soln. of the same electrolyte in liquid A was measured by means of the cell

N HgCl electrode | KCl aq. | MR in H_2O | MR in A | KCl in A | KCl aq. | N HgCl electrode

arranged in app. so that the distance that the current had to travel through the relatively poorly conducting phases with liquid A was short. Data are given for 85 phase-boundary potentials for 50 inorg. and org. salts in H_2O and in amyl alc., butyl alc. or furfural. When the electrolyte is uni-univalent, the potential between the 2 liquid phases can be calcd. from sp. partition coeffs. for the ions. A number of such sp. ion partition coeffs. between butyl alc.-satd. H_2O and H_2O-satd. butyl alc. are given. A method of detg. the relation between concn. and boundary potential is described.

F. L. Browne

The amphoteric character of cadmium hydroxide. J. Piater. Univ. Leipzig. *Z. anorg. allgem. Chem.* **174**, 321–41(1928).—The soly. of $Cd(OH)_2$ in H_2O and NaOH solns. at 25° has been detd. in order to ascertain if it possesses acid properties. By this means, the weakly acid character of $Cd(OH)_2$ has been proved. The solubilities of one CdO, and three $Cd(OH)_2$ prepns. were detd. by cond. measurements.

Preparation	Soly. at 25°
CdO	1.70×10^{-5} mols./l.
$Cd(OH)_2$, cryst., 1% alkali	1.30×10^{-5} mols./l.
$Cd(OH)_2$, from NH_3	1.14×10^{-5} mols./l.
$Cd(OH)_2$ (pptd. from dil. soln.)	
directly after prepn.	1.11×10^{-5} mols./l.
after 9 months	1.18×10^{-5} mols./l.

J. H. Perry

Molecular condition of salts in solution. H. Ulich and E. J. Birr. Univ. Rostock. *Z. angew. Chem.* **41**, 443–6, 467–72(1928).—A discussion of the characteristics of aq. and non-aq. solns. of salts. Among the solvents considered are H_2O, MeOH, EtOH, Me_2CO, formaldehyde, MeCN, epichlorohydrin and C_5H_5N, and the conditions represented by infinite diln., finite diln. and concd. solns. are studied. H. Stoertz

The titrimetric determination of acids and bases in various solvents. K. Linderstrøm-Lang. *Dansk. Tids. Farm.* **2**, No. 8, 201–32(1928); cf. *C. A.* **22**, 1115.—Brønsted's (*C. A.* **17**, 3821) conception of acids and bases was taken as a basis for L.'s investigation. Other references suggested are: "Theorie der alkalimetrischen und acidimetrischen Titrierungen" by N. Bjerrum, and *Fys. Tids.* **16**(1917–18). (I) Conception of acid and base, cf. Brønsted. Substances that in various solvents are capable of giving off H^+ are termed acids, those capable of adding H^+ bases. Equil. equation between bases (B) and acids (A), becomes $B + H^+ \rightleftharpoons A$. Substances capable of giving off or taking on H^+ are ampholytes, *e. g.* $H_2PO_4^- + H^+ \rightleftharpoons H_3PO_4$; $HPO_4^{--} + H^+ \rightleftharpoons H_2PO_4^-$; the $H_2PO_4^-$ is thus an ampholyte. Other examples are given. (II) Equil. equation in aq. soln. (AcOH considered). $p_H = p_A - \log (C_{AcOH}/C_{AcO^-})$, where p_A represents the acid's strength exponent. This expression is readily expanded to $p_H = P - \log C_A/C_B$ (5) where P is the acid-base exponent, a term dependent on the nature (strength) of the corresponding acids and bases but not on their concn. C_A or C_B or on p_H. Equation (5) is expressed graphically with p_H = abscissa and C_A/C_B = ordinate. At the point where $C_A = C_B$, $P = p_H$ (where acid and base are present in equil. amts.). The curve also shows that a base and its corresponding acid have the same acid-base exponent, this being higher the stronger the base and weaker the acid. A table is given showing the value of P for a no. of corresponding acids and bases. Ampholytes also enter in, and appear in 2 diff. equations: one where ampholyte appears as an acid and one where it appears as base, *e. g.*, P_A and P_B. A table shows values of P_A and P_B for a no. of ampholytes. (III) Problem of concn p_H. It is not known how molecules exist in soln., *e. g.*, NH_3 probably forms a series of complexes: $NH_3.H_2O$; $NH_3.2H_2O$, etc. H^+ is unable to exist in the free state, but in H_2O it exists as H_3O^+, associated with H_2O; $H_3O^+.H_2O$; $H_3O^+.2H_2O$, etc.; similarly for other solvents. From thermodynamic reasoning L. suggests stating concn. as $C_{MA} = (C_H)$; C_B and C_A = total concn. of H^+, bases and acids in all the forms of complexes in which they appear in pure un-ionized solvents, *viz.*, NH_3 in H_2O = $C_B = C_{NH_3} + C_{NH_3 \cdot H_2O} + \ldots$ The expression $p_H = -\log C_H$ is considered inaccurate, whence p_H is defined as $p_H = (E - 0.3380)/0.0577$ (9), where E is the potential of the cell Pt, H_2 soln. | KCl | 0.1 N KCl | Hg_2Cl_2, Hg (1) (18° C. – 760 mm.). (IV) Equil. equation in various solvents. Equation (5) holds, since P depends on the nature of acid and base as well as solvent, but not on C_A, C_B and C_{MA}. A table showing values of P for H_2O, aq. MeOH and EtOH is given. (V) The special relation of the solvent (M). Solvent M is considered an ampholyte. Then $C_{MA} = C_{MH^+} + C_{H^+2M}$, etc

$C_{MB} = C_{M^-H^+} + C_{2M^-H^+}$, etc., or for H_2O, $C_{MA} = C_{H_3O^+} +$, etc. $C_{MB} = C_{OH^-} + C_{OH^-H_2O}$, etc. The problem is to formulate an equil. equation similar to (5). The different complexes are considered in equil. or $C_{MH^+}.C_M = K_1.C_{H^+2M}$, etc., for processes $MH^+ + M = H^+2M$; $H^+2M + M = H^+3M$, etc., but C_M may be considered const. or $C_{MH^+}/C_{2MH^+} = K_1 \cdot C_{2MH^+}/C_{3MH^+} = K_2$, or for dil. solns. where the concn. of the complexes is const. $C_{MH^+} = K_1'(C_{MH^+} + C_{2MH^+} + \ldots) = K_1'.C_{MA}$. Substituting in the equil. equation for M's base function $p_H = P_B - \log C_{MH^+}/C_M$, C_M = const. and $C_{MH^+} = K_1'.C_{MA}$, one obtains $p_H = L_B - \log C_{MA}$ (16) in which L_B is a new const., the M's base exponent. But $p_H = -\log C_H = -\log C_{MA}$ or $L_{B(H_2O)} = 0$. In similar fashion it can be shown that $p_H = L_A + \log C_{MB}$ (17), where L_A is M's acid exponent. Subtracting (16) from (17) $L_B - L_A = \log C_{MA} + \log C_{MB} = \log (C_{MA}.C_{MB})$, which states that the difference between L_B and L_A is the log of the dissocn. const. A table showing values of L_B and L_A for different solvents is given. (VI). The elements of the titration theory. In this part the author develops equations for titrating a base with an acid, error from medium, titrand (base) and titrator (acid), and corresponding equation for titrating acids with bases. For titrating a base with an acid m_B and m_A = g. equiv. of base or acid in solvent. V = vol. in liters and C_B or C_A g equiv. per liter; thus $m_B = VC_B$; $m_A = VC_A$, TA = titrating acid. TA is dissolved in pure solvent to a known concn.; the titrand medium contains Q_B g. equiv. base. Q_{TA} = g. equiv. acid used to reach the end point as detd. by p_H value. The no. of H^+ which TA has given off must be the no. H^+B has taken on ± no of H^+ medium (M) has required or $TH = m_A + V(C_{MA} - C_{MB})$ (20) or from (5) $Q_B = m_A + m_B = m_A(1 - 10^{pH'-P})$ (21) and from (16) and (17) $C_{MA} = 10^{L_B - pH'}$, $C_{MB} = 10^{pH'-L_A}$. $TH^+ = [Q_B/(1 + 10^{pH'-P})] + V(10^{L_B-pH'} - 10^{pH'-L_A})$ (22). If TA is a corresponding acid to the medium then $Q_{TA} = TH^+ = Q_{MA}$. Substituting Q_{TA} in (22) gives equation (23). If, however, TA is a different acid with an acid-base exponent P_T, one obtains $[Q_{TA}/(1 + 10^{P_T - pH'})] = [Q_B/(1 + 10^{pH'-P})] + V(10^{L_B-pH'} - 10^{pH'-L_A})$ (25). Equations 23 and 25 may readily be expanded so as to apply to mixts. of bases. From (25) it will be seen that $Q_B = Q_{TA}$ when $V(10^{L_B-pH'} - 10^{pH'-L_A})$ (error of medium), $10^{pH'-P}$ (titrand error) and $10^{P_T-pH'}$ (titrator error) disappear. The author now goes on to give a math. treatment of these different errors, of the uncertainties of the titration and of titrations of mixts. of bases, also corresponding considerations of titrating acids with bases. A discussion of indicators is also given, together with a considerable no. of examples. Part (VII) conclusion. A brief discussion of the results obtained in the examples given in (VI). O. A. NELSON

The electrometric determination of the concentration of calcium ions by means of electrodes of the third class. M. H. CORTEN AND I. ESTERMANN. Hamburg Univ. *Z. physik. Chem.* **136,** 228–30(1928).—Both of the electrodes $Ag \mid Ag_2C_2O_4 \mid CaC_2O_4 \mid Ca^{++}$ and $Zn \mid ZnC_2O_4 \mid CaC_2O_4 \mid Ca^{++}$ were found to give potentials accurate and reproducible to 0.001 v. The construction of such electrodes is described. Their application to the measurement of Ca^{++} concn in blood serum will be described later. R. L. D.

New practical application of the quinhydrone electrode, of new indicators and of the de Wulff leaf colorimeter to spectrophotometry. GEORGES HUGONIN. *Chimie & industrie* **Special No.,** 732–74(April, 1928).—A crit. review, with bibliography of 66 references. A. PAPINEAU-COUTURE

The principles of the electrometric determination of hydrogen-ion concentration and their practical execution. R. SCHMIDT. *Kl. Mitt. Ver. Wasserversorg. Abwässerbeseitig.* **3,** 269–78; *Chem. Zentr.* **1927,** II, 2328.—A general, comprehensive description of electrometric methods for measuring the reaction of a liquid, with special reference to quinhydrone electrodes. Tables show the p_H values for temps. from 18° to 24° for different millivolt readings. C. C. DAVIS

Determination of hydrogen-ion concentrations in phosphate and borate mixtures by means of the quinhydrone electrodes. EINAR BIILMANN, ANDREAS KLIT AND TOIVO SWAETICHIN. *Biochem. J.* **22,** 845–54(1928).—The quinhydrone electrode gives correct p_H values in phosphate mixts. up to 7.73; the quinoquinhydrone electrode, up to p_H 7.38. The hydroquinhydrone electrode gave stable potentials but too low p_H values. BENJAMIN HARROW

A rapid method for determining colorimetrically the p_H of small amounts of solutions. OSCAR W. RICHARDS. *Science* **68,** 185(1928).—A description is given for the prepn. and use of a pipet designed to insure uniform samples for color comparisons. Covering the spotting plate with a thin layer of pure white vaseline made the drops stand up like beads. W. W. STIFLER

The stratification phenomenon in electrodialysis as an electrophoretic occurrence. F. BLANK AND E. VALKÓ. *Biochem. Z.* **195,** 220–7(1928).—The appearance of a colloid-

free layer in electrodialysis is shown to be due to combined effect of electrophoretic and hydrostatic forces. S. MORGULIS

Dialysis. III. Temperature coefficient of dialysis. H. BRINTZINGER AND B. TROEMER. Jena Univ. *Z. anorg. allgem. Chem.* **172,** 426–8(1928).—When the temp. and sp. surface are const. and when the uniformity of the inner liquid and the zero concn. of the outer liquid are preserved, then dialysis proceeds according to the law $c_t = c_i e^{-\lambda t}$, where λ is a typical const. dependent upon the membrane, the magnitude of the sp. surface, the concn., the presence of other diffusible and non-diffusible substances and upon the temp. B. and T. detd. λ for a large no. of substances and found a connection between λ and the magnitude of the elec. field intensity with the surface of the ions concerned. They also detd. the change in λ of electrolytes with change in concn. and in the presence of other electrolytes. Apparently, the difference in chem. and phys. bound water is reflected in the magnitude of λ. The dialysis coeffs. (for $F = 1$) of equimolar solns. were detd. at different temps., the temp. curve for λ being obtained. The equation holding is $\lambda_{T'} = \lambda_T[1 + \alpha(T' - T)]$, where α is a typical coeff. of every substance. Exptl. data, etc., will be published later. S. L. B. E.

Surface tension and solvation in salt solution. P. P. KOSAKEVICH. Chem. Lab., Inst. Volkswirtschaft, Charkow. *Z. physik. Chem.* **136,** 195–207(1928).—The capillary-rise method was used to study the effect of I, Br, Cl and Li, Na and K ions on the surface tension of pyridine, $(CH_3)_2CO$, CH_3OH and HCOOH. With all these solvents the capillary activity of the ions was in the order I > Br > Cl and Li > Na > K. With the cations this order is the reverse of that observed for H_2O solns., but the order for the anions is the same as for H_2O. The order I > Br > Cl also held for C_2H_5OH-H_2O mixts. when the C_2H_5OH concn. was greater than 0.2 *N*. From the relationship between capillary activity of the salts of these ions and the compn. of the alc.-H_2O mixts. was calcd. the order of the distribution coeffs. of these salts between alc. (solvation) and H_2O (hydration). The lyotropic series I > Br > Cl, observed for non-aq. solvents, was attributed to decreasing solvation. R. L. DODGE

The osmotic pressures of concentrated solutions. WILDER D. BANCROFT AND HERBERT L. DAVIS. Cornell Univ. *J. Phys. Chem.* **32,** 1(1928); cf. *C. A.* **22,** 527.—An enlargement of the ideas in the article referred to, emphasizing the doctrine of relating osmotic pressure to the *volumes of the solvent in soln.* B. and D. derive 2 equations (1) $PV_m = RT \ln (p_0/p_1)$ and (2) $PV_1 = RT\left(\frac{N}{n}\right) \ln (p_0/p_1)$. P is osmotic pressure; p_0 and p_1 are vapor pressures of solvent and soln., resp.; V_m is the g.-mol. vol. of the *solvent in soln.* (assuming the mol. wt. is that in the vapor phase); V_1 is the vol. in soln. of the mass of solvent contg. 1 mol. of solute; N and n refer to solvent and solute, resp. They discuss the validity of equations of the gas-law type to represent osmotic phenomena and point out that the absence of any function of the heat of diln., a work term which cannot be evaluated, prevents these equations from ever being exact. The relations between equations (1) and (2) and mol. wt. calcn., b. p. and f. p. changes are given. Equation (1) is used to det. vols. in soln. and conversely from density and vapor pressure data, osmotic pressures are calcd. It is also pointed out that equations of the type of that used by van der Waals for gases may be well applied to solns. R. E. GIBSON

Osmotic pressures of concentrated solutions. J. H. HILDEBRAND. *J. Phys. Chem.* **32,** 1086–8(1928).—A criticism of Bancroft and Davis' recent papers (*C. A.* **22,** 527; preceding abstract) on osmotic pressures of concd. solns., particularly as to their misinterpretation of Raoult's and van't Hoff's equations. G. L. C.

Composition of bone. V. Some properties of calcium citrate. M. J. SHEAR AND BENJAMIN KRAMER. Jewish Hosp., Brooklyn, N. Y. *J. Biol. Chem.* **79,** 161–75 (1928).—Cond. titration of NaCl with Na citrate gives normal results in good agreement with calcd. values. Abnormal results are obtained with $CaCl_2$; an ionic reaction occurs which results in a decrease in the no. of ions, but with further addn. of Na citrate fewer and fewer ions are removed from soln. until finally no further diminution occurs and the resistance then decreases in agreement with the calcd. values. These results are direct evidence for the binding of Ca ions by Na citrate in some kind of sol. complex. A. P. LOTHROP

Liquid binary mixtures and so-called molecular compounds. GEORG WEISSENBERGER. *Metallbörse* **17,** 708; *Chem. Zentr.* **1927,** II, 2144.—The vapor-pressure curve of a binary liquid mixt. is, as already shown in extensive investigations of W. (*C. A.* **21,** 1215), in no way a straight line, the curve showing important deviations. Positive deviations of the vapor pressure curve of chlorotetralin-acetone occur when both kinds of mols. exercise a repulsive action against each other, whereas negative deviations

are found where the mols. attract each other, as with Cl_2CHCO_2H-Et_2O. If this attraction is great enough, solid mol. compds. are formed. This *transition between mixts. and compds.* manifests itself in other phys. properties. C. C. DAVIS

The permeability of membranes. V. The diffusion of nonelectrolytes through the dried collodion membranes. A. A. WEECH AND L. MICHAELIS. Johns Hopkins Univ. and Marine Biol. Lab., Woods Hole, Mass. *J. Gen. Physiol.* **12**, 55–81(1928); cf. *C. A.* **22**, 1516.—$(CH_3)_2CO$ and urea pass through a dried collodion membrane much more rapidly than does glycerol; glycerol diffuses much faster than glucose. The rate of diffusion varies directly with the difference in concn. of the solns. sepd. by the membrane. The presence of glycerol on the two sides of the membrane does not appreciably affect the rate of diffusion of $(CH_3)_2CO$. Expts. showed that the membrane channels may gradually become clogged with glucose mols. so that the diffusion rate decreases from day to day until the stationary gradient is reached. The collodion membrane is conceived as a sieve with pores of about mol. size. Differences in diffusion rate are probably due to differences in size of the diffusing mols., the relatively large glycerol and glucose mols. being unable to pass through the smaller pores available for the passage of urea and $(CH_3)_2CO$ mols. In attempting to correlate the ratio between the diffusion rates of 2 different substances with the concn. potential, *CoP* (cf. Michaelis, Ellsworth and Weech, *C. A.* **21**, 3008; Michaelis and Perlzweig, *C. A.* **21**, 2837), given by the same membrane, the results were: (1) the acetone-glycerol ratio shows no correspondence; (2) the acetone-glucose ratio suggests a relation; (3) the glycerol-glucose ratio shows a definite correspondence, the higher ratios being obtained with membranes giving high *CoP* values. An explanation of the facts is proposed which postulates an adhesion or adsorption between the anions of electrolytes and the surface of the pore channels, whereas in the case of diffusing nonelectrolytes there are no adhesive forces, the rate of passage depending upon the no. of pores large enough to transmit the mols. The no. of pores which will permit the passage of acetone and glycerol is too small to fall in the range of potential variation. The no. of pores which will transmit glycerol and glucose, however, is included in the range where there is an evident relation between the diffusion rate ratios and the *CoP* value. C. H. R.

The kinetics of nitrous acid. I. Introduction and review. II. Pertinent experiments. E. ABEL AND H. SCHMID. *Z. physik. Chem.* **132**, 55–77(1928).—The reaction mechanism of the decompn. of HNO_2 has been studied as being the controlling factor in the rate of the reaction between N_2O_4 and H_2O. Unless supersatn. of the soln. with NO is not avoided, the rate of disappearance of HNO_2 is not a measure of the rate of the reaction: $3HNO_2 \longrightarrow H^+ + NO_3^- + 2NO + H_2O$. **III. Kinetics of the decomposition of nitrous acid.** *Ibid* **134**, 279–300.—The app. and technic are described for the study of the decompn. of HNO_2 according to the equation: $3HNO_2 \longrightarrow H^+ + NO_3^- + 2NO + H_2O$. The reverse reaction has not been studied. The rate of the forward reaction is proportional to the 4th power of the undissocd. acid, and inversely proportional to (NO concn.)^2. The rate of decompn. is also inversely proportional to the square of the partial pressure of NO. The reaction rate coeff. is an almost linear function of the ionic concn. for which math. expressions are given. If SO_4 ions are present, the reaction mechanism is greatly complicated. The decompn. reaction involves the hydrolysis of N_2O_4 as a side reaction, the rate of which is expressed by the equation: $-d(N_2O_4)/dt = 2 \times 10^4 P_{N_2O_4}$, where $P_{N_2O_4}$ is the partial pressure of N_2O_4. **IV. Kinetics of the formation of nitrous acid from nitric acid and nitric oxide.** E. ABEL, H. SCHMID AND S. BABAD. *Ibid* **136**, 135–45.—The rate of reaction, according to the gross equation: $HNO_3 + 2NO + H_2O \longrightarrow 3HNO_2$ is proportional to the H-ion concn., the NO_3-ion and the HNO_2 concns. HNO_2 is an autocatalyzer. The rate is independent of the partial pressure of NO, and decreases slightly with increasing ion concn. Sulfate ions are retardant to the reaction. The formation of HNO_2 occurs in two steps: (1) $H^+ + NO_3^- + HNO_2 \longrightarrow N_2O_4 + H_2O$; and (2) $N_2O_4 + 2\,NO + 2\,H_2O \longrightarrow 4\,HNO_2$, and (1) dets. the rate of the gross reaction. J. H. PERRY

Nitration velocities. F. H. COHEN. Univ. Amsterdam. *Verslag. Akad. Wetenschappen Amsterdam* **37**, 593–601(1928); cf. Wibaut, *C. A.* **10**, 184.—Aromatic substances were nitrated in Ac_2O. The analysis was made by pouring a known quantity of mixt. into KOH of 1.3 d., removing nitrobenzene by C_6H_6 extn. and detg. KNO_3 by Devarda distn. HNO_2 was detd. colorimetrically by the Griess-Ilosvay method, the HNO_2 being neutralized with solid AcONa. From expts. at 25° (C_6H_6 in Ac_2O) k from $2.3025/t(C_0 - C_0')\log(C_0'C/C_0C')$ (bimol.) was const. up to 51.6% reaction (HNO_3 C_0 = 0.6682, C_6H_6 C_0' = 0.4385, HNO_2 = 0.0011, t = 574 min.) and equal to 0.00232. On adding 8 mg. urea to take HNO_2 away, this k for approx. the same C

values decreased to 0.00140 and 37.2% reaction yield in 546 min. The nitrous acid is a catalyzer. The question of side reactions of HNO_3 with the solvent is discussed; no definite results were obtained although it was found that the titer of HNO_3 in Ac_2O decreases from 0.72 to 0.29 in 1811 min. more or less linearly. The reaction of HNO_3 and Ac_2O is considerable, almost to explosivity, catalyzed by a few drops strong H_2SO_4. At 18° was found k = 0.00128 for the benzene nitration reaction, a temp. coeff. of 2.3; at 0° and 40° the "const." was irregular. No nitration was found in glacial AcOH soln. The HNO_3 content was unchanged after 24 hrs.; addns. of anhydride did not change this. B. J. C. VAN DER HOEVEN

Group theory of homopolar chemical combination. W. HEITLER. *Z. Physik* **47**, 835–58(1928).—Mathematical. An extension of the theory of Heitler and London (*C. A.* **21**, 3542). B. C. A.

The activity coefficients of sodium and potassium hydroxides in their corresponding chloride solutions at high constant total molality. HERBERT S. HARNED AND JOHN McA. HARRIS, JR. Univ. of Penna. *J. Am. Chem. Soc.* **50**, 2633–7(1928). Measurements at 25° of the e.m.f. of the cells H_2 | KOH (m_1), KCl (m_2) | K_xHg | KOH (m_0) | H_2, wherein ($m_1 + m_2$) is const. at 3.5 molal, and of the cells H_2 | NaOH (m_1), NaCl (m_2) | Na_xHg | NaOH (m_0) | H_2, wherein ($m_1 + m_2$) is const. at either 3.5 or 5 molal, have been made, and the activity coefficients of the hydroxides in the chloride solns. calcd. The variations of activity coefficients with total molalities in the several cases are not strictly linear, although the discrepancies are not large. WILLIAM E. VAUGHAN

The rate of reaction of liquid and gaseous zinc with carbon monoxide. RUSSELL W. MILLAR. *J. Am. Chem. Soc.* **50**, 2707–9(1928).—A series of distns. of Zn in CO at temps. near 700° showed no free C when SiO_2 formed the walls of the reaction chamber. If firebrick contg. Fe was used also in the reaction vessel C sepd., but if no Fe was in the firebrick no C was obtained. The reduction of CO by Zn at 600–700° is extremely slow in the absence of a catalyst—probably slower than the decompn. of CO into CO_2 and C under the same conditions. But Zn reduces CO_2 rapidly at the given temps. The production of ZnO in a Zn-condenser is due then to the oxidation of Zn by CO_2 or H_2O vapor. Pure CO is an excellent atmosphere in which to distil Zn, provided the walls of the vessel are free from Fe. W. C. EBAUGH

Problems of energy transfer in chemical reaction kinetics. C. N. HINSHELWOOD. *Physik. Z.* **29**, 556–8(1928).—In bimolecular gaseous reactions the no. of mols. reacting per sec. is, almost without exception, equal in magnitude to the no. of mols. colliding per sec. multiplied by $e^{-E/RT}$, where E is the heat of activation. In quasi-monomol. reactions the time interval of reaction of a mol. is greater than the mean interval between collisions; hence an activated mol. may be deactivated before it has opportunity to react. k is then equal to $N \times f(E) \times X$, where N is the total no. of mols., $f(E)$ is the fraction of mols. having sufficient energy to react and X is a probability coeff. At low pressures such reactions no longer show quasi-monomolecular behavior, k decreasing with pressure. A quantum-theory treatment of mol. sizes is suggested in connection with the problem of the decompositon of N_2O_5, which under certain condition shows a greater reaction rate than the max. calcd. rate of activation. Aspects of other problems in chem. kinetics are briefly mentioned. R. L. HERSHEY

Influence of electrolytes on the velocity of cataphoresis and relations between the electrokinetic potential and electromotive potential of gold. NATHANIEL THON. *Compt. rend.* **187**, 119–22(1928).—For the same system of contact the electromotive potential φ and the electrokinetic potential ζ represent two different magnitudes. Some electrolytes cause first an increase of negative potential ζ. Some reduce ζ from the beginning. The first type is obtained only with salts having univalent cations. The inhibiting effect increases with the diminution of the soln. pressure of the cation: Example: $ZnSO_4$, $NiSO_4$, $CuSO_4$, $Ca(NO_3)_2$, $Pb(NO_3)_2$. L. D. R.

The accuracy and practical execution of the quantitative kinetic analysis for bimolecular reactions. LENNART SMITH AND J. LINDBERG. *Ber.* **61B**, 1709–17(1928). The equation describing the reaction is given and its mathematical significance is explained. Calcd. and observed values are given for mixts. of glycerol-α-monochlorohydrin. Two methods of measuring percentage error are used which check. Data are given on the accuracy of the calcn. of this kinetic mechanism during reaction. RAYMOND H. LAMBERT

Phosgene equilibrium. R. NITZSCHMANN. *Metallbörse* **17**, 1601–2; *Chem. Zentr.* **1927**, II, 1513.—A theoretical derivation of the conditions for the formation of $COCl_2$ according to the equation: $CO + Cl_2 \longrightarrow COCl_2 + 24{,}600$ cal. The const. K is 2422 × 10^{-14} at 300° abs., 1526 × 10^{-3} at 700°, 1700 × 10^{-2} at 800°, 11,334 × 10^{-1} at 900°, 5256 × 10^{-1} at 1000°. Tabulated data are given for the range of 95

99%. the temps. −15.34° to 22.43° and P = 1–2 at. on the liquefaction stage, the end concn. and the tension of initial liquefaction. J. S. REICHERT

The law of electrolyte equilibrium and conductivity. K. JABLCZYNSKI. *Roczniki Chem.* **8,** 22–30(1928); cf. *C. A.* **16,** 3021; **18,** 3513.—The dissocn. consts. K of KCl, KBr, KI, KCN, RbCl, RbBr, NH_4I and NH_4CNS were calcd. from the cond. according to the Jablczynski and Wisniewski equation for mass action. They are practically const. and agree well with the K calcd. from ebullioscopic data. K increases in the order Cl, Br, I, in accordance with the increasing atomic radius. The K of NaCl and LiCl the cations of which are hydrated was equal to that of KCl only after extrapolation: $K_\alpha = K + A.N^{1/3}$. The same K was calcd. from the f. p. It is practically the same for the 3 chlorides, the radii of N_α, Li and K being practically equal. Kohlrausch's equation does not give const. values. With the aid of his equil. equation J. calcs.: $\lambda_\alpha = \lambda + d^{1/3}.N^{1/3}$ (1), where $d = 1/\lambda_\alpha^{1/3}K$. d is const., while a in Kohlrausch's equation decreases inversely with the concn. (1) is preferable to the equation of Debye and Huckel since it gives very satisfactory agreement up to concns. of 3 N, while the equation of D. and H does not obtain above 0.01 N.

MARY JACOBSEN

Equilibrium of solutions of barium chloride and lead chloride in hydrochloric acid and water. P. VOLKOV. *Ann. inst. anal. phys. chim.* (*Leningrad*) **3,** 704–24; *Chem. Zentr.* **1927,** II, 2702.—For the *purification of $BaCl_2$-$RaCl_2$ solns. contg. $PbCl_2$*, a knowledge of the contemporary solv. of $PbCl_2$ and $BaCl_2$ in HCl and water should be of value. The following exptl. data give the no. of g. of HCl in 1000 g. of water and the no. of g. of $PbCl_2$ per 1000 g. of water which are sol. in the HCl soln.: *at* 25°: 0, 10.8; 8.68, 2.37; 38.50, 1.29; 126.6, 2.55; 249.7, 10.10; 422.0, 42.85; 553.4, 61.00; *at* 0°: 0, 6.25, 8.36, 0.771; 51.01, 0.410; 175.15, 2.275; 383.7, 29.97; 574.0, 56.65. The initial decrease in the solv. of $PbCl_2$ with increasing concn. of HCl is attributed to the influence of the common ion, and the subsequent increase in the solv. of $PbCl_2$ is attributed to the formation of complexes. The solv. of $BaCl_2$ in HCl has already been measured by Eliseev (*C. A.* **21,** 3820). The solv of $PbCl_2$ is greatly diminished at first by the addn. of $BaCl_2$ but with large addns. of $BaCl_2$, it is increased. The following data give the no. of g of $BaCl_2$ per 1000 g. of water and the no. of g. of $PbCl_2$ per 1000 g. of water which are sol in the $BaCl_2$ soln.: *at* 25°: 50.8, 1.98; 103.6, 1.83; 230.0, 3.33; 338.8, 6.59; *at* 0°. 51.6, 0.635; 124.2, 0.627 The triple point ($BaCl_2.2H_2O$ and $PbCl_2$ in the ppt) lies at $BaCl_2$ 375.5 and $PbCl_2$ 8.7 at 25° and at $BaCl_2$ 310.5 and $PbCl_2$ 2.5 at 0°. The soly. of $BaCl_2$ is only slightly increased by the addn. of $PbCl_2$. By the addn of HCl to a soln. satd simultaneous with $BaCl_2.2H_2O$ and $PbCl_2$, the soly. of $BaCl_2$ is reduced and that of $PbCl_2$ increased Thus at 25° the following data were obtained: HCl (g per 1000 g. water) 38.6, 101.5, 148.9, 194.9, 301.99, 553.4; $BaCl_2$ (g per 1000 g water) 252.1, 95.05, 32.1, 9.6, 0.9, 0.00; $PbCl_2$ (g. per 1000 g. water) 6.05, 4.05, 4.02, 5.81, 17.85, 61.00. The effect of HCl at 0° is similar Since from the triple soln." only $BaCl_2$ is pptd. by HCl, the removal of $PbCl_2$ from radioactive $BaCl_2$ can be carried out. C. C. DAVIS

The equilibrium $2K_3Fe(CN)_6 + 2KI \rightleftharpoons 2K_4Fe(CN)_6 + I_2$ in aqueous potassium chloride solutions. VICTOR K. LA MER AND KARL SANDVED. Columbia Univ. *J. Am. Chem. Soc.* **50,** 2650–65(1928).—The equil. state for the reaction $2Fe(CN)_6^{---} + 3I^- \rightleftharpoons 2Fe(CN)_6$ IV $+ I_3^-$ has been studied analytically for the K salts in pure H_2O as well as in aq. KCl solns. as solvents. With H_2O as solvent the value of $K_{eq.}$ changes 35% when the concn. of KI is increased from 0.15 M to 0.20 M, but the corresponding change is less than 2% in the presence of 1.0 M KCl. The data confirm the principle that the law of mass action holds for ionic systems when a sufficient excess of neutral salts is present to maintain a const. elec. environment, although this law fails completely in absence of excess of neutral salts. The inadequacy of the principle of ionic strength for high-valence ions is also evident in this system. The equil. const. in the absence of salt effects has been computed from e. m. f. data and found to be 0.199×10^{-3}. Addns. of HCl up to a p_H value of about 3.5 is without influence upon $K_{eq.}$, but is of marked influence in more acid ranges. R. H. LOMBARD

Systems with recurrent fusion curves. I. A. SMITS. Univ. Amsterdam. *Z. physik. Chem.* **135,** 63–72(1928).—By starting with van der Waals' equation for the phase equil. between 2 coexisting phases, by thermodynamic reasoning an equation for the equil between 3 phases, gas, liquid, solid, at the vapor pressure is set up in which the temp. coeff. of compn. of the liquid phase, x_L, is connected with the vol. change and heat evolution. Examn. of this equation shows that ordinarily $T(dx_L/dT)$ is positive, that is, the fusion curve on the T-x diagram has a positive slope. If the solid phase sepg at lower temp. is a hydrate which at some higher temp. changes to the anhyd

salt while the salt mols. in soln. remain mostly hydrated, a condition arises in which soln. of the anhyd. salt in the satd. soln. is accompanied by a strongly exothermal chem. reaction. Under such circumstances $T(dx_L/dT)$ may become negative and the fusion curve take a negative slope (recurrent curve). If as the temp. increases further the dissolved salt mols. become less hydrated, the fusion curve may bend back through a point with a vertical tangent and become positively sloped once more, continuing until the m. p. of the pure anhyd. salt is reached. A recurrent fusion curve may also arise from the close approach of the fusion curve to the critical curve, in which case a crit. end point is reached, that is, the fusion curve runs into the vapor curve. At a still higher temp. a sep. branch of the fusion curve emerges again from the vapor curve and continues until it meets the m. p. of the solid. Such a case has been observed in the system ether–anthraquinone. Theoretically a third case should be possible in which the fusion curve swings from a negative slope caused by equil. between anhyd. solid phase and liquid phase contg. dissolved hydrate, passes through a vertical tangent to attain a positive slope, and then again swings back through a second vertical tangent to a negative slope caused by proximity to the crit. curve, finally reaching a critical end point. **II.** (1) **The system water sodium selenate.** A. SMITS AND W. M. MAZEE. *Ibid* 73–6.—The *T-x* diagram for the system H_2O–Na_2SeO_4 is given. Below 30.3° the solid phase is $Na_2SeO_4.10H_2O$ from the eutectic at 1 mol. % Na_2SeO_4 to 7.5 mol. %, with the fusion curve sloped positively. Above 30.3° the solid phase is Na_2SeO_4 and the fusion curve has a negative slope. At about 170° and 6.25 mol. % Na_2SeO_4 there is a vertical tangent to the fusion curve which then slopes in the positive direction until it reaches the m. p. of Na_2SeO_4 at 777°. **II.** (2) **The system water–sodium sulfate.** A. SMITS AND J. P. WHITE. *Ibid* 77–8.—The solid phase below 32.4° from the eutectic to 6 mol. % Na_2SO_4 is the hydrate $Na_2SO_4.10H_2O$ and the fusion curve slopes positively. Above 32.4° the solid phase is Na_2SO_4 and the fusion curve slopes negatively, passes through a vertical tangent at about 140° and 4.75 mol. % Na_2SO_4, and at 235° reaches a transition temp. at which the rhombic form of Na_2SO_4 changes to the monoclinic. Above 235° the fusion curve has a negative slope again until it reaches a critical end point at 365°. The change of crystal form probably prevents the exptl. realization of the theoretically interesting case of a continuous fusion curve with 2 vertical tangents. **III.** (3) **The system water-magnesium sulfate.** A. SMITS, J. RINSE AND L. H. LOUWE KOOYMANS *Ibid* 78–84.—The hydrate $MgSO_4.12H_2O$ is stable from the eutectic to about 2°, $MgSO_4.7H_2O$ from 2° to 48°, and $MgSO_4.6H_2O$ from 48° to 70°, all with fusion curves sloping positively. Above 70° and 8 mol. % $MgSO_4$ the fusion curve for $MgSO_4.H_2O$ slopes sharply to the left and then at about 200° and about 0.1 mol. % $MgSO_4$ it bends back nearly vertical, but reaches a crit. end point at 265°. F. L. BROWNE

Theory of sorption. II. Mechanism of heterogeneous catalysis. O. SCHMIDT. *Z. physik Chem.* **133,** 263–303(1928).—The sorption at 1 atm. pressure and at const temp. between 0° and 150° of gases for which the mol. diam. is less than the mean diam. of the pores of the adsorbent, is found to be expressed by $\log c = a\sqrt{\lambda} - b$, where c is the quantity of gas adsorbed per unit weight of adsorbent, λ the latent heat of evapn., and a and b are consts. which are for a given adsorbent independent of the nature of the gas, but vary with temp. and pressure. The equation, which has also been derived theoretically, is applicable to the adsorption of gases by colloids and by liquids. Deviations are found when chem. reaction takes place readily. If ionization of the adsorbed gas occurs, forces of attraction, addnl. to those of van der Waals, are called into play, and the force needed for sepn. of the mols. of the gas is greater than the calcd. values. B. C. A.

Our knowledge of catalysis. RICHARD WILLSTÄTTER. *Z. Ver. deut. Ing.* **72,** 901–5(1928).—The history of catalysis is briefly discussed with the earlier ideas concerning catalysis and the intermediate compds. theories. Examples of catalytic processes are given among which are the NH_3 synthesis, acid and basic catalysis in org. reactions, the use of mixed catalysts in the methanol and hydrocarbon synthesis, and enzymes in biological processes and enzymes. M. R. FENSKE

Influence of arsenic on the catalytic activity of platinum for the oxidation of sulfur dioxide. EDWARD B. MAXTED AND ARTHUR N. DUNSBY. *J. Chem. Soc.* **1928,** 1600–3.—In accordance with other known data on catalytic poisoning the first amts. of poison produce the greatest effects. The first part of the curve for catalytic activity *vs.* mg As per 0.35 g. of Pt is approx. a straight line up to about 0.7 mg. As. The first 0.7 mg. As per 0.35 g. Pt. reduces the activity to 45% of its original value, and a further 9.3 mg., *i. e.*, 13 times the first wt. of poison only depresses the activity from 45 to 26% of its original activity. M. R. FENSKE

Interpretation of the sugar inversion by the dualist catalysis theory and by the activity of hydrogen ions. M. Duboux and R. Mermoud. *Helv. Chim. Acta* **11,** 583–97(1928).—The inversion of sugar has been carried out in the presence of HCl (0.091–3.6N) and HNO_3 (0.74–3.69 N). No proportionality exists between the velocity const. and the H-ion concn. as detd. by cond. The dualist catalysis theory gives an erroneous explanation of the observed facts. In the first approximation, the velocity const. is proportional to the H-ion activity, when the catalyst is HCl. A. L. H.

Active surface of catalysts. Bennosuke Kubota. *J. Fuel Soc. Japan* **6,** 149–55; *Chem. Zentr.* **1927,** II, 1536; cf. *C. A.* **22,** 1520.—Explanations which have been suggested by various investigators dealing with the active surface of catalysts are reviewed, and expts. are described in which Ni catalysts prepd. at various temps. were used with 3 types of compds., *viz.*, aromatic hydrocarbons, aliphatic hydrocarbons and C-free compds., using also a catalytic poison. It is concluded that Ni "consists of various inorg. ferments," that there is a constitutional relationship between these "ferments" and hydrogenating substances and that the Ni surface has a sp. action. C. C. D.

Catalytic action of mineral waters. F. C. Gaisser. *Z. angew. Chem.* **41,** 401–7 (1928).—The benzidine reaction has been investigated for a no. of naturally occurring waters. Those showing a pos. reaction invariably contain ferrous or manganous ions, or both but the converse does not hold. Further, waters contg. Fe and Mn are the most active catalysts of the decompn. of H_2O_2. The explanation of these relationships, however, remains obscure. Expts. have also been made on the catalytic activity of the waters during the hydrolysis of starch. B. C. A.

Partial oxidation of methane and ethane in the presence of catalysts. T. E. Layng and R. Soukup. *Ind. Eng. Chem.* **20,** 1052–5(1928).—The catalytic partial oxidation of various mixts. of CH_4 and C_2H_6 and also of natural gas with O was studied by the dynamic method within the temp. range of 100–700°. For the production of alcoholic or aldehydic intermediates, catalysts of Cu and Ag and oxides of these metals, activated charcoal, Pt oxide and BaO_2 proved unsatisfactory on the basis of hydrocarbon consumed and products obtained. On using small amts. of NO_2 and passing the mixt. through capillary tubes yields of 15–30% of oxygenated derivs. were obtained. Auxiliary catalysts proved ineffective. $MeNO_2$ promotes the partial oxidation. D. F. Brown

Studies on catalytic action. XXII. Catalytic action of reduced copper on unsaturated hydrocarbons. Shigeru Komatsu and Masao Kurata. *Mem. Coll. Sci. Kyoto Imp. Univ. Series A* **11,** No. 3, 163–9(1928); cf. *C. A.* **22,** 1265.—The monocyclic terpenes, menthene, *d*-limonene and β-phellandrene were converted by non-reversible catalysis of reduced Cu into cymene and menthene. 54 g. of menthene was passed over Cu catalyst prepd. from 10 g. of CuO, at the rate of 4.5 g./hr. at 290–300°. The product consisted of menthane, cymene and unchanged menthene. Passing *d*-limonene at 280–300° over Cu catalyst yielded completely cymene. At 200° and a rate of 4 5 g. per hour cymene and menthane were found in the product. When 5.3 g. of phellandrene was passed in 2 hours over a Cu catalyst at 300°, the product contained cymene and menthane. M. R. Fenske

The catalysis of oxidation by iron according to Handovsky. Otto Warburg. *Biochem. Z* **198,** 241–2(1928).—Handovsky's theory that catalysis of oxidation by iron in charcoal is due to the H_2 gas which the Fe contains is questioned. S. M.

Acid and salt effects in catalyzed reactions. XV. Catalytic activity of hydrochloric acid in the hydrolysis of ethyl acetate. Harry M. Dawson and Wm. Lowson. Univ. Leeds. *J. Chem. Soc.* **1928,** 2146–54; cf. *C. A.* **22,** 3338.—The concn. range of HCl as catalyst for the hydrolysis of EtOAc is carried much lower than in previous work (0.01N). At a concn. of 0.01N HCl, the hydrolysis is markedly affected by the AcOH. This factor must be taken into account in any consideration of thermodynamic activity of H ion. The sep. influence of AcOH was carefully studied. For the range of concn. 0.0002–0.2N HCl, the constancy of k within the limits of exptl. error shows that the initial velocity of hydrolysis is proportional to the concn. of HCl. Over this range the mean activity coeff. falls from 0.997 to 0.884. There is no apparent connection between the catalytic activity and the thermodynamic activity. **XVI. Catalytic effects in the iodination of mesityl oxide.** Harry M. Dawson and Arthur Key. *Ibid* 2154–65.—The reaction between mesityl oxide and I in dil. aq. soln. is similar to but 200 times more rapid than the reaction between acetone and I. Varying results from samples of the same sp. gr. and n (cf. Harries, *Ber.* **32,** 1329(1899); *Ann.* **330,** 189(1904)) were due to impurities. The reaction is probably of the keto-enol type. The curve for log x *vs.* time is approx. a straight line, for the later stages of the reaction. (x = concn. of the catalytically active H ion.) Considerable deviation was found,

however, in the early stages, showing autocatalytic effects which are accounted for by the joint catalytic effect of the H ion and the undissocd. water mol. The relative values for the catalytic coeffs. for H^+, OH^-, H_2O, CH_3COOH, $CH_3CO_2^-$, $H_2PO_4^-$, and HPO_4^{--} vary considerably from their relative values for the acetone reaction.
A. J. Currier

Synthesis of organic substances and of ammonia starting with water gas without employing catalyzers. Brutzkus. *Compt. rend.* **187,** 124–5(1928).—Control of temp., pressure, and concn. has demonstrated the truth of the deduction "All chem. reaction can be directed and accelerated in a given direction by exterior variations, continuous and simultaneous, of pressure, temp., and concn. of different substances acting in opposed direction to those of variations provoked by the desired reaction." The greatest pressure employed was 50 atm.
L. D. R.

Autoxidation and antioxygen action. Catalytic properties of phosphorus compounds. Charles Moureu, Charles Dufraisse and Marius Badoche. *Compt. rend.* **187,** 157–61(1928).—PBr_3 is a good antioxygen for BzH in 1 part per 1000. H_3PO_2 is a less active antioxygen for furfurole and BzH. H_3PO_3 is very good for furfurole while Na_2HPO_3 suppresses the oxidation of BzH. H_3PO_4 is also a good antioxygen The tertiary phosphines, in general, are good antioxygens. Dimethylphenylphosphine, diethylphenylphosphine, methyldiphenylphosphine, ethyldiphenylphosphine protect well BzH, furfurole and styrolene. The primary and secondary phosphines are less active.
M. R. Fenske

Autoxidation and antioxygen action—catalytic properties of phosphorus. Charles Moureu, Charles Dufraisse and Marius Badoche. *Compt. rend.* **186,** 1673–7 (1928).—The action of white P on the antioxidation of BzH, oil of turpentine and furfurole was studied. It is possible that the active catalyst with white P is due to some product of oxidation. The effect of red P is similar to that of white P but less intense.
M. Fenske

Catalysts for the reaction $CO + H_2O \rightleftharpoons CO_2 + H_2$. W. Dominik. Main School of Agr., Warsaw. *Przemysl Chem.* **12,** 229–35(1928).—From theoretical considerations the following equation for $CO + H_2O \rightleftharpoons CO_2 + H_2$ is derived $\frac{x - x_2}{x - x_1} = \frac{x_0 - x_2}{x_0 - x_1} \cdot e^{-b(K-1)(x_1 - x_2)1/V}$. This is like that for bimolecular reactions in homogeneous systems. b is a const. which characterizes the useful surface of the catalyst at a given temp., $K = [CO_2][H_2]/[CO][H_2O]$ = equil. const at a given temp., V = space velocity of the gas vapor mixt. in cm.³/hr./g. of catalyst, x = partial pressure of CO_2 in the reaction mixt., x_0 = partial pressure of CO_2 before the reaction, x_1 and x_2 the 2 roots of the equation

$$\frac{x(p_0H_2 + x - x_0)}{\{p_0CO - (x - x_0)\}\{p_0H_2O - (x - x_0)\}} - K = 0,$$

in which p_0H_2, p_0CO and p_0H_2O represent the partial pressures of the respective components before the reaction and only x_2, the root with the negative radical, represents the pressure of CO_2 at equil To test this exptly. the extent of the reaction was measured after the gaseous mixt had passed over one and over two exactly equal portions of the catalyst under the same conditions. A whole series of detns. shows that the catalysis of water gas does proceed according to the derived equation, but that possibility of small difference of temp. lowers the accuracy of the detns.
A. C. Zachlin

Acid and basic catalysis. J. N. Brønsted. Univ. of Copenhagen. *Chem. Reviews* **5,** 231–338(1928).—In the text the field of acid and basic catalysis is covered up to March 1926. In an appendix the progress in 1926–1927 is included. In the review a crit. exposition of the theories of acid and basic catalysis is given and also an outline of the modern views on catalytic salt effect. The phenomena of acid and basic catalysis are discussed on the basis of views of the acid-basic function which have their foundation in the work on the catalytic decompn. of nitramide and reactions like the mutarotation of glucose.
M. R. Fenske

Researches on catalysis at reduced pressure. V. Grignard. *Bull. soc. chim.* **43,** 473–91(1928); cf. *C. A.* **22,** 1890.—The app. used in the low-pressure expts. is described. The catalysts used were Ni, Cu, Pt black and Pt oxide of Vorhees and Adams They were supported on fine pumice. Revivification of the catalyst by means of O_2 was also used. The hydrogenation of tertiary methylheptenols $Me_2C{:}CHCH_2CH_2CMeROH$, was studied since they do not hydrogenate normally by the usual catalytic methods. With Ni at ordinary pressure at 180–200°, hydrogenation yields the satd. hydrocarbon With Pt methylheptenone and the hydrocarbon are formed. But with Ni at about 15 mm pressure, hydrogenation of the alc. begins at 90°; it is about ³/₄ complete at 90–100° and

essentially quant. at 160–170°. The velocity of hydrogenation at 15 mm. is not much different from that at ordinary pressure. At low pressure desorption is more rapid and so the life of the mol. on the catalytic surface is appreciably reduced. Hydrogenation of benzonitrile with Ni at 175° and 10–13 mm. yields the imine, $C_6H_5CH = NH$ The mechanism of the hydrogenation of phenol was studied. Cyclohexanol begins to yield cyclohexanone at 155° at 18-22 mm.; at 50 mm. the temp. is 160°, while at 760 mm. the temp. is 180°. With benzoyl chloride at 300° and ordinary pressure with Ni benzaldehyde, benzene, toluene and benzoic acid were formed. But by hydrogenating at the same temp. but at 300 mm. a yield of 60% benzaldehyde was obtained. The nickel catalyst rapidly loses its activity as a result of the formation of $NiCl_2$, but with Pt or Pt oxide excellent results were obtained. At 225° and 140 mm., 60% of the benzoyl chloride is converted into benzaldehyde principally. Phenylpropionyl chloride at 200° and 400 mm. yields 20% aldehyde, with the remaining 80% unchanged. The reduction of aromatic aldehydes and ketones was also investigated. With benzaldehyde and Ni at 200° and ordinary pressure, about 58% was reduced to toluene, while the rest was decomposed into CO and C_6H_6. At 150° and 25 mm., 40% of the aldehyde is reduced to benzyl alcohol; at 100 mm and 150°, 67% reduction to alcohol is attained. Increasing the temp. to 180–200° forms besides the alcohol, a viscous condensation product distg. at 200° under 6 mm. In addn. the mechanism of the hydrogenation, of α-ethylenic ketones, and the dehydrogenation of alcohols was studied.

M. R. Fenske

The Landolt-reaction. V. The catalytic action of sodium thiosulfate on the Dushman-reaction. Wadim Roman-Levinson. *Z. Elektrochem.* **34,** 333–50(1928).—The Dushman-reaction is: $IO_3^- + 5I^- + 6H^+ = 3I_2 + 3H_2O$ Three related reactions are (1) the Dushman-S-reaction, *i. e.*, the above reaction in the presence of sulfite as reducing agent, (2) the Dushman-T-reaction, *i. e.*, the reaction occurring in the presence of thiosulfate as reducing agent; and (3) the Dushman-S-T-reaction, *i. e.*, thiosulfate catalyzing the reaction used with sulfite. As long as the thiosulfate concn is small compared to the sulfite concn., the S-T reaction is the principal time-detg reaction. The reaction time decreases with increase in thiosulfate concn. and reaches a min when the thiosulfate concn is commensurate with the sulfite concn. From here on the T-reaction dets the time, the reaction time increasing with increasing thiosulfate concn. The formation of various complex compds of the iodate, iodide, sulfite and thiosulfate ions are discussed.

M. R. Fenske

Equilibrium between hydrogen-carbon monoxide and methane-carbon dioxide in the corona discharge. Gerald L. Wendt and Gregg M. Evans. *J. Am. Chem. Soc.* **50,** 2610-21(1928). The gaseous phase in the reaction, $2 CO + 2 H_2 = CO_2 + CH_4$ reaches an equil at a compn of 37.1% CO, 37.6% H_2, 13.3% CO_2 and 8.7% CH_4, corresponding thermodynamically to 900-950° K. Contraction continues, however, and the end products are C and H_2O.

G. M. Evans

The system sodium carbonate sodium bicarbonate-water and the region of existence of trona, $Na_2CO_3.NaHCO_3.2H_2O$. Rudolf Wegscheider and Josef Mehl. Univ. Wien *Monatsh.* **49,** 283-315(1928).—The equil. between aq solns. of Na_2CO_3 and $NaHCO_3$ and the pptg solid phases, in the absence of NaCl, was measured at 11 different temps between 20° and 94.5°. In the presence of NaCl it was studied at 3 temps At 90°, 1 or 2 double salts sep. which are richer in CO_2 than trona, $Na_2CO_3.NaHCO_3.2H_2O$ This on decompn. by water gives labile Na_2CO_3.

M. R. F.

Chemical equilibrium in the vapor of a mixture of paraffins and unsaturated hydrocarbons. H. A. Wilson Rice Institute, Houston, Texas. *Proc. Roy. Soc.* (London) A120, 247-51(1928); cf. *C. A.* **22,** 902.—Using the same method of attack as in previous paper, W derives the equation $y = {}^1/_2 - \sqrt{{}^1/_4 - K'f/p(1-f)}$, where y is the fraction of the total pressure p due to unsatd. hydrocarbons in equil. with liquid and vapor The calcd. results show that doubling the pressure diminishes the unsatd. compds in vapor to ${}^1/_3$, while raising the temp. 50° F. should double them. The max. mol percentage of unsatd compds. in vapor is 50% for equil. conditions. If values of $K'f/p(1-f)$ greater than ${}^1/_4$ are chosen equil. cannot be established and decompn. will go on till only vapor remains. This is the case at 15 atms. and at temps. 825, 850, 875° F It is well known that the amt. of unsatd. compds. is diminished by increasing the pressure. Coke may be considered as a highly unsatd. hydrocarbon; the rate of coking increases with temp. rise, and is lowered by increasing pressure since it is an unsatd compd.

Arthur Fleischer

The definition of "area" in the case of contact catalysts. F. Hurn Constable. St. John's College, Cambridge, England. *Nature* **122,** 399–400; cf. *Proc. Roy. Soc.* (London) A119, 196(1928); cf. *C. A.* **22,** 3818.—The area of an activated contact catalyst will

vary with the method of measurement adopted. It is thus essential that the max. area of a surface should be defined carefully, so that the results of all measurements can ultimately be compared with this standard. At the present time it seems best to define the "max." area of a surface as the area of the envelope of H atoms covering it completely with a unimol. film, because this gives as nearly as possible an abs. definition. The measurement of this max. area is a matter of great difficulty. The interface method, the H adsorption method, and the electrolytic H deposition method all give results less than the max. area. R. L. DODGE

Equilibrium in binary systems containing urea as one component. NIKOLA A. PUSCHIN AND DESIDER KÖNIG. Univ. Zagreb. *Monatsh.* **49,** 75–82(1928).—The phase diagrams of 8 binary systems contg. urea plus one of the following were constructed, the method of thermal analysis being used: trichloroacetic acid, phenol, resorcinol, hydroquinone, guaiacol, α-naphthol, naphthalene and diphenyl. The data show that urea with trichloroacetic acid, resorcinol, hydroquinone and phenol forms definite compds., the first 3 forming substances of equal molal compn., while those with phenol consist of 1 mol. of urea with 2 mols. of phenol. In the cryst. state urea with guaiacol and α-naphthol form only mech. mixts.; with naphthalene and diphenyl, urea is not miscible in the liquid condition but seps. into 2 layers. M. R. FENSKE

Ternary systems. VII. The periodates of the alkali metals. ARTHUR E. HILL. N. Y. Univ. *J. Am. Chem. Soc.* **50,** 2678–92(1928).—Study of the 25° isotherm for the system KIO_4-KOH-H_2O showed that only 2 stable salts form from aq. soln., namely, KIO_4 and $K_4I_2O_9.9H_2O$. The soly. of these salts in H_2O was detd. between 0° and 100°. $K_4I_2O_9.9H_2O$ undergoes a transition to the anhyd. form at about 78°. Three stable Na salts form from aq. soln in the system $NaIO_4$-$NaOH$-H_2O, namely, $NaIO_4.3H_2O$, $Na_2H_3IO_6$, and $Na_3H_2IO_6$. The soly. of Na metaperiodate, $NaIO_4$, was detd. between 5° and 50°. A transition point between the hydrate and the anhyd. form occurs at 34.5°. The wide difference in the soly. of KIO_4 and $NaIO_4$ may be used as a means for the analytical sepn. of K and Na. The secondary Na periodate, $Na_2H_3IO_6$ is found, when in an amorphous condition, to hold a small quantity of H_2O with a vapor tension apparently as low as that of the compd.; at 100° the rate of loss of H_2O, adsorbed or of compn., averages about 0.01% per day under atm. aq. pressures. The tertiary salt also adsorbs H_2O, and the rate of loss of H_2O adsorbed or of compn. is about $^1/_6$ as great. Action of HIO_4 on metalperiodates did not produce acid salts. $LiIO_4$ could not be formed in a pure state. NH_4IO_4 could not be formed at all by the oxidation of the iodates by Cl_2 in the presence of the appropriate bases. R. H. LOMBARD

Generalization of the methods of residues; determination of the degree of hydration of solid phases in systems in equilibrium. V. P. SHISHOKIN. *Ann. inst. anal. phys.-chim.* (Leningrad) **3,** 746–9; *Chem. Zentr.* **1927,** II, 2702; cf. *C. A* **22,** 3802.—The method of Schreinemaker (*Z. physik. Chem.* **11,** 81(1893)) which allows the detn. of the constitution of the ppt. present as the solid phase if the compn. of the soln. and the compn. of the soln. plus the solid phase are known, is applied to the detn. of the sepd. salt. *E. g.*, with a NaCl-$MgSO_4$ soln. with NaCl and a $MgSO_4$ hydrate as solid phases it is sufficient to analyze a sample of the soln. and of the total residual system to ascertain the compn. of the hydrate (*C. A.* **21,** 3802). C. C. DAVIS

Freezing point-solubility relations of geometrical isomers. I. The β-chlorocrotonic acids. EVALD L. SKAU AND BLAIR SAXTON. Yale Univ. *J. Am. Chem. Soc.* **50,** 2693–2701(1928).—Measurements of f. p. for the system β-chlorocrotonic acid-β-chloroisocrotonic acid with an *improved f. p. app.* (cf. *C. A.* **20,** 136) show straight lines for $1 + \log N$ *vs.* $1000/T$ and heats of soln. of 5220 and 4120 cal. per mole for the normal and iso acids, resp. Calorimetric data for heats of fusion differ by 270 and 820 cal. per mole, resp., in the same direction corresponding to values 3° and 5° below those observed near the eutectic compn. Heat contents, sp. heats and heats of fusion are reported. Comparison of these data and those for the crotonic acid-isocrotonic acid system indicate that geometrical isomers show small deviations from mutual ideality but not such as would indicate complex or mixed-crystal formation. Possible explanations are a slight difference in the internal pressures or polarity of the 2 substances or a slight heat of mixing. Less polar isomers may be more nearly ideal. FOSTER DEE SNELL

Deviations from the regular temperature scale. F. HENNING AND J. OTTO. Berlin-Charlottenburg. *Z. Physik* **49,** 742–8(1928).—A crit. review is given of the phys. basis for the 6 values adopted for the international temp. scale by the Oct. 4, 1927 Conference of Weights and Measures in Paris. It is concluded that these values do not differ from earlier temp. scales by more than the exptl. errors involved in the detns. H. R. MOORE

The temperature of the vapor from a solution. K. Schreber. *Z. tech. Physik* **9,** 277–85(1928); cf. *C. A.* **21,** 1368.—For accurate measurement of the temp. of water vapor evolved by a boiling salt soln. the Ruoberg arrangement (up and down circulation of vapor through concentric jackets surrounding the distn. column) was improved on by heat insulation. The total height of the column was 500 mm., the diam. of column proper and jackets 40, 80 and 140 mm.; five thermoelements were used for the measurements, 7 Hg thermometers for control. The accuracy was 0.2°. The boiling vessel was 100 × 95 mm. heated by electricity. After proper equil. had been established the temps. were read every 10 min., superheating of the thermometers was eliminated as shown by boiling pure water. The result found was (in agreement with Faraday's contention, contrary to Gay Lussac) that the vapor entering the column is cooler than the boiling liquid; the vapor leaves the soln. probably at the temp. of boiling pure solvent. B. J. C. van der Hoeven

The limiting value of the latent heat of vaporization and of the specific heat of saturated vapor at zero absolute. Nikolaus v. Kolosovskii. *Z. physik. Chem.* **136,** 314–6(1928).—Proofs by Van Laar and others based on assumption that latent heat is finite and therefore that the sp. heat of satd. vapor is $-\infty$ at $T = 0$ are pure tautologies. F. R. B.

Thermal dissociation of cadmium nitrate. G. Malquori. Univ. of Rome. *Gazz. chim. ital.* **58,** 217–22(1928).—See *C. A.* **22,** 2333. C. C. Davis

Physicochemical studies on higher fatty acids. I. The thermal analysis of the binary mixtures of the stearic and palmitic acids and of the stearic and of the palmitic triglycerides. N. N. Efremov. *Ann. inst. polytech. Oural* **6,** 155–204(1927).—E. shows by means of f. p.-concn. diagrams that the system of the 2 acids has the behavior typical of a mixt. of 2 isomorphous compds., the diagram having only one min. at 52.5° and 68% by wt. of palmitic acid The solid solns. of the acids are not quite stable. They decompose very slowly, yielding probably either a mech. mixt. of the components of eutectic compn., or a chem. compd. of varying compn. of the so-called Bertollid type. By his measurements of the viscosity and by the study of the microstructure of the binary system, E. is able to confirm entirely his results of thermic analysis. The stearic and palmitic triglycerides do not have double m. ps., as has been stated sometimes. E. finds instead that both esters exist in at least 3 polymorphous modifications each. The stable α-modifications are formed on rapid cooling of the molten stearic and palmitic glycerides. Their m. ps. are 53.2° and 48.4°, resp. The β-modifications can be obtained by a very slow cooling of the glycerides. They are of a soft texture and transparent and are stable in the temp. range 55.2–64.9° and 53.8–60.0° correspondingly. Crystn takes place, however, usually only below 55.2° and 53.8°, because of strong and unavoidable undercooling of the liquids. The α-modifications can be easily superheated and transformed into β modifications without melting at 53.2° and 55.2° correspondingly. By careful heating of the latter modifications above 64.9° and 60.0°, γ-modifications can be obtained. These are non-transparent, have m. p. at 69.3° and 67.5° and cannot be obtained by crystn. from the molten compds. directly, as either α- or β-modifications are then formed. The f. p.-concn. diagrams of the binary mixts. of the 2 esters show that all 3 modifications form solid solns. of the 3rd type according to classification of Roozeboom. The α-modifications have the eutectic at 44.9° and 79.5% by wt. of palmitic glyceride. Similar and symmetrical results are obtained with β- and γ-modifications. The first have eutectic at 47.8° and 75% of 3-palmitic ester, the second at 52.3° and 72.4%. G. B. Kistiakowsky

Heats of solution and dilution of some strong electrolytes. Erich Lange. *Fortschritte Chem. Physik physik. Chem.* **19,** No. 6, 1–83(1928).—The first half of the paper is a theoretical treatment of the various heats of soln. and diln., including factors affecting their values, relationships among them, and theories of the heat of soln., especially in the limiting case of infinite diln. After a survey of methods for detg. these heats, full descriptions are given of an adiabatic calorimeter for detg. large heats and a differential adiabatic calorimeter with a sensitivity of $5 \times 10^{-6°}$. With this, heats of diln. for chlorides, sulfates and nitrates of different valence types were detd. All salts showed positive heats of diln. at very great diln. in accordance with the Debye-Huckel theory. The heats of diln. of 5 alkali halides at concns. below 0.01 *M* agree as the theory of equal types demands, but all salts examd. are not consistent in this respect. The temp. coeff. of the heat of diln. as detd. for two salts is below the theoretical value. Lucy K Pickett

The specific heats of gases and their importance in the calculation of "chemical constants." Schmolke. *Wärme* **50,** 395–400; *Chem. Zentr.* **1927,** II, 1497.—A

study of the application of the kinetic theory of gases and the quantum theory to sp. heats shows that the theories could not hold a step further in the realms of high-pressure steam and heat transfer. New theoretical investigations are therefore necessary.
J. S. REICHERT

The state and specific heat of gases at infinite volume. R. D. KLEEMAN. *J. Franklin Inst.* **205,** 691–8(1928).—A theoretical paper. W. T. RICHARDS

Specific heats of superheated steam and gases at high temperatures and pressures. VITTALE GALLINA. *Ann. scuola ing. Padova* **4,** 77–87(1928).—A review of various equations of state including those of van der Waals, Clausius, Sarrau, Amagat, Kamerlingh Onnes, Planck and Callendar. A. W. CONTIERI

The heat of combustion of benzoic acid. W. A. ROTH. *Z. physik. Chem.* **136,** 317–20(1928).—The value of Roth, Doepke and Banse (following abstract) for the heat of combustion of fused BzOH (26.433 kilojoules at constant volume per g. in vacuum) agrees with best old values. The heat of combustion of iron wire to Fe_3O_4 is 1.58 cal per mg. F. R. B.

Absolute determination of the heat of combustion of benzoic acid. W. A. ROTH, O. DOEPKE AND HILDEG. BANSE. Tech. Hochschule, Braunschweig. *Z. physik. Chem.* **133,** 431–42(1928).—Because of contradictions in the literature, the heat of combustion of BzOH has been redetd. Two independent investigations were carried out with different heat resistances, different methods of measurements and different samples of BzOH. Since cryst. BzOH is hygroscopic, in one detn. the fused salt was used, care being taken to seed the melt with an original crystal so as to avoid the formation of another form of the acid. The thermometer could be reliably estd. to 0.0005°. The bomb was a Langbein-Hugerstoff model, lined with Pt and completely immersed. The pressure of the O used was 35 atms. The calorimeter was not worked adiabatically. The av. value is 6323 cal$_{15}$. S. L. B. ETHERTON

Heat of combustion of benzoic acid in the international joule. W. JAEGER AND H. V. STEINWEHR. Physikalisch-Technischen Reichsanstalt. *Z. physik. Chem.* **135,** 305–46(1928).—The exptl. method is given in complete detail. The measurements of temp. and the complete technic are fully described. The av. value of a no. of combustions on BzOH from different sources is 26.437 kilojoules per g. at 19.3°. Comparison is made with the value of Fischer and Wrede, 26.449 kj. and of Dickinson, 26.436 kj. The mean of these values is 26.441 kj. per g., or at 15°, the heat of combustion is given as 6319.3 cals. per g. M. R. FENSKE

Heat capacities of organic compounds at low temperatures. I. Precision calorimeter and thermostat for low temperatures. DONALD H. ANDREWS. *J. Franklin Inst.* **206,** 285–99(1928).—In designing this calorimeter to measure accurately the sp. heats of org. compds. between —200° and room temp., certain exptl. difficulties were faced, *viz.:* these compds. have low heat cond.; many are corrosive; many can be obtained only in very small quantities. The calorimeter proper consists of an 18-karat-gold vessel of about 100-cc. capacity. A reentrant tube from the bottom supports through the center a no. of gold disks which serve to distribute the heat from the heating coil in the tube to the contents of the calorimeter. A carefully designed thermostat with automatic photoelec. temp. control makes it possible to maintain the calorimeter in a vacuum-jacketed chamber at any desired temp. between —180° and 50° to within 0.01. An automatic device keeps the heating coil in circuit for exactly 3 min., accurate to $^1/_{60}$ sec. The rise in temp. of about 2° produced in the calorimeter and its contents is measured by carefully calibrated thermocouples with an accuracy of about 0.005 at —180° and 0.001° at room temp. Results are given for heptaldehyde, ranging from 0.258 cal. per g. at —167.57° to 0.431 cal. per g. at —80.32°. Full details of the various pieces of app. are given. W. W. STIFLER

The electron thermochemistry of inorganic substances. A. BERKENHEIM. Second State Univ. of Moscow. *Z. physik. Chem.* **136,** 231–58(1928).—Many inorg. substances, such as the halides and oxides, show regularity in their *heats of formation* both in vertical and horizontal rows of the periodic table. Since, according to Born, the heats of formation may be resolved into the sum of the heats of sublimation, of ionization, of dissocn. and the energy of electrostatic attraction, these last should also show periodic regularity. B. finds that they do, and he also finds that there is similar regularity among ionic radii. By means of these relationships, he is able to calc. the lattice energy of the alkali halides and the alk. earth oxides and obtains results which agree well with those of Born. MALCOLM DOLE

Thermodynamic deduction of Maxwell's distribution law. A. N. SHCHUKAREV. *Physik. Z.* **29,** 181–2(1928).—Maxwell's deduction is open to criticism, although the

law is in accord with experience. An attempt has therefore been made to deduce the law from thermodynamic principles. B. C. A.

The second law of thermodynamics in general relativity. RICHARD C. TOLMAN. Cal. Inst. of Technology. *Proc. Nat. Acad. Sci.* **14,** 701–6(1928); cf. *Proc. Nat. Acad. Sci* **14,** 268, 348, 355(1928).—In an extension of thermodynamics to general relativity a postulate analogous to the second law has previously been presented. Originally this had the form which it took when applied to an isolated finite system and was justified by showing that it reduced to the second law in the limiting case. In the present work the new postulate is regarded in the form it takes when applied to a non-isolated infinitesimal system. The new form also leads to an expression for the entropy of a system in a stationary state, which agrees with the usual relation between entropy and probability. H. F. JOHNSTONE

Note concerning thermodynamic calculations. DAVID F. SMITH. U. S. Bureau of Mines. *Ind. Eng. Chem.* **20,** 859–60(1928); cf. *C. A.* **21,** 2783.—The synthesis of hydrocarbons especially C_6H_6, from water gas is considered. The rate of reaction is stressed as an important factor, for free-energy values alone will not tell what species predominates. Comments are made on Francis' calcns. of the free energies of various hydrocarbons and alcs. (*C. A.* **22,** 1131), and it is pointed out that the use of thermal data often leads to erroneous results. Values obtained from equil. consts., where all substances involved are at the standard fugacity of 1 atm., are more reliable H. R. MOORE

Thermodynamics based on statistics. I. GILBERT N. LEWIS AND JOSEPH E. MAYER. Univ. of Calif. *Proc. Nat. Acad. Sci.* **14,** 569–75(1928) —The basis of statistical treatment has been Planck's view that the abs. entropy is the total no. of possibilities of a system. Systems may be treated by considering every change in the system or by limiting the variables, *i. e.*, inhibited systems. A system is completely defined by (1) energy, (2) vol and (3) amt of each species of independent constituent. The basis of the present treatment is the partition of mols. into regions. The *detailed regions* are described by specifying the no. of mols of each independent constituent in the region. If a system is divided into J and K (spacial, energy, or mol. species distribution) there is a finite no. of detailed states that the system as a whole can assume. Ω represents the possible no of detailed states, d a given distribution. The following equation is deduced: $(\log \Omega^d_J) + (\log \Omega^d_K) = 0$. Ω^d, the no. of states at equal distribution, always smaller than Ω but Ω^d always greater than average no. of states of distribution. For the equil. distribution, except for small nos. and regions $\log \Omega^d = \log \Omega$. For every system there is a natural mode of partitions into regions which dets. the $\log \Omega$. If certain inhibitions are accepted they must be abided by in detg the $\log \Omega$. This comprises the 2nd and 3rd laws of thermodynamics. The essential idea involved is that thermodynamic properties are detd. with all possible exactness when detailed states are specified to a finite degree. Conversely, thermodynamic properties det. mech. states only within finite limits. **II.** *Ibid* 575–80.—From the equations derived for Ω, the total no. of regions, the equations $(dS/dE)_V = 1/T$, $(dS/dV)_E = P/T$, and $(dE/dV) = -P$ are derived. The identity of S, T and P are then proved to be the thermodynamic quantities entropy, temp. and pressure. From the above fundamental equations, the remaining equations of thermodynamics can be derived. ARTHUR FLEISCHER

Formulas for the internal energy and entropy of a substance or mixture. R. D. KLEEMAN. *J. Phys. Chem.* **32,** 1396–1410(1928).—A theoretical paper. W. T. R.

Measurements of the thermal conductivity of crystals and crystalline material. A. EUCKEN. *Fortschritte Mineral. Kryst. Petrog.* **12,** 31–2(1927).—Mixed crystals of alkali halides showed poorer thermal cond. than the pure halides. There was found to be no relation between thermal cond. and hardness. J. F. SCHAIRER

Thermal conductivity of metals and nonmetals. A. EUCKEN. *Physik. Z.* **29,** 563–6(1928).—E reviews the Debye theory of thermal cond. and its exptl. verification, for non metallic crystals and crystal masses. The roles of the electron and the lattice in the thermal cond. of metals are also discussed (cf. *C. A* **22,** 3090). R. L. H.

Hall effect in single metal crystals. P. I. WOLD. *Science* **68,** 183–4(1928).—The Hall effect in single crystals of Si steel (3.8% Si) was approx. 15 times as great as that for pure Fe. It is independent of the direction of orientation of the crystal, and this is true also for single crystals of Cu. Taken in connection with recent work of Van Everdingen this suggests that further investigations on the possible effects of crystal orientation on the Hall effect should be made on metals which do not have a cubic lattice structure. W. W. STIFLER

Practical pyrometry. G. B. Brook and H. J. Simcox. *J. Inst. Metals* No. **470,** 10 pp.(1928).—Temp. indicators can be satisfactorily protected against magnetic effects by shielding with soft-iron plates, thereby increasing the accuracy of readings taken. A double shielding with air-gap showed an even greater advantage. An instrument embodying these and other special features is exhibited. Where several couples are connected to the same recorder, trouble is often experienced by the interference of one couple with another, because of contact of the couple with the sheath tip. This can be overcome by using a thimble of insulating material on the end of the thermocouple to protect it from the sheath. The use of lead-covered paper-insulated cable is recommended as connecting cable between the couple and the recording instrument. Cast Fe, coated regularly with a wash of equal parts of French chalk and graphite mixed to the consistency of a thick cream with 10% Na silicate soln., has been found by expt. to be the best material for a thermocouple-protecting sheath for resisting the attack of molten Al. Since couples, particularly those contg. Ni, are very susceptible to the attack of S in the furnace gases, it was found possible, by using lime between the inner and outer sheaths, not only satisfactorily to protect the Ni, but also to enable the couples to be used at a temp. at least 100° above the max. recommended by the makers of the wire. A quick-reading couple suitable for use in many non-ferrous metals can be made by leaving about $^1/_2$ in. of wire bare at the end of the couple, the rest being insulated with silica tubing of small bore, protected by asbestos cord. The contact between the wires is not made by twisting, as is usually the case, but by the molten metal itself. Such a couple enables the operator to read the temp. in about 15 sec. M. R. Fenske

Measurement of the temperatures of stationary flames. A. G. Loomis and G. St. J. Perrott. *Ind. Eng. Chem.* **20,** 1004-8(1928).—The method of Kurlbaum Fery (described in detail) was used to measure the flame temps of CH_4, C_2H_6, natural gas and CO mixts The method consists in comparing the brightness temp. of a continuous radiator, *viz.*, a W band lamp, with the brightness of the radiation from the flame colored with NaCl vapor at $\lambda = 0.589\mu$. It is shown that the true flame temp is equal to the brightness temp of the W radiator, as read with an optical pyrometer when the spectral line is just reversed as seen in a spectrometer. Comparison of these values with those obtained by means of the Natl. Phys. Lab.'s method giving temp. as a function of the current heating a Pt strip gave agreement within 20°. Calcd. temps. based on thermodynamic principles employing values of ΔH and sp. heats from the work of Lewis and Randall (*C. A.* **20,** 1941) differed from 25° to 70°. H. L. O.

Measurement of flame temperatures. Ezer Griffiths and J. H. Awbery Brit. Nat. Phys Lab. *Gas. J.* **183,** 596(1928); *Gas World* **89,** 261(1928).—Two methods are discussed In one, a refractory metal in the form of wire is heated electrically *in vacuo*, and the relation between temp. and heating current is detd. by an optical pyrometer. The same wire is then inserted into the flame, and the relation between temp. and heating current is again detd. When the results are plotted graphically, the point of intersection of the two lines will give the temp. of the flame, for at the temp represented by this point the electrical supply is sufficient to balance the radiation loss, whether the wire is in vacuum or in the flame, so that the surrounding gas in the flame neither imparts nor abstracts heat from the wire. Wires of different diams gave identical values. In the second method, a beam of light from an incandescent W sphere was focused through the flame on to the slit of a spectroscope. Na was introduced into the flame, and when the temp. of the flame was greater than that of the W sphere, bright Na lines showed up in a continuous spectrum background. If the temp were lower, reversal of the Na lines took place. By careful adjustment of the temp of the sphere, a point was reached when all trace of either bright or dark lines disappeared. This balance could be effected within a range of a few degrees. The corresponding temp. of the sphere was then detd. by means of an optical pyrometer. The results were independent of the thickness of the flame. Li gave the same results as Na, except that a thick flame from a 10-in. water-cooled burner was required for satisfactory work. Two flames at different temps. were measured individually and then superimposed and measured again. A mathematical formula was worked out which gave good agreement with the observed data. The apparent temp. of 2 superimposed flames differs markedly from the mean and is dependent on the relative positions of the flames. It would appear, therefore, that the method cannot be applied to estimate the av. temp. of a heterogeneous flame. The method is devoid of time lag and therefore may be of value in connection with internal-combustion engines, having already been tried with promising results. F. S. Granger

The initiation of flame in mixtures of carbon monoxide and oxygen. W. E. Garner

AND A. S. GOMM. Univ. of Bristol. *Trans. Faraday Soc.* **24**, 470–3(1928); cf. Garner and Johnson, *C. A.* **21**, 1059.—The rate of reaction of $2CO + O_2 \longrightarrow 2CO_2$ with an initial pressure of 0.3 cm —below the critical ignition pressure—was detd. at 750° in a quartz vessel with and without infra-red radiation. The infra-red had no appreciable effect on the reaction. For moderately dry and moist gases the crit. pressure of ignition is independent of temp. and is between 0.3 and 0.5 cm. for the range 660–850°. The rate of reaction for quartz surfaces is greater for moist than for dry gases. There is evidence that the reaction occurs in the gas phase at 850°. When the rate of surface reaction exceeds a certain value, a change is initiated into the gas phase, which is propagated as flame. ARTHUR FLEISCHER

Diffusion flames. S. P. BURKE AND T. E. W. SCHUMANN. *Ind. Eng. Chem.* **20**, 998–1004(1928).—Diffusion flames as distinguished from those of the Bunsen type which result from a premixing of air and gas, are defined as those in which combustible gas and air meet coincidently with the occurrence of combustion. On the basis of the following assumptions which are valid within limits, a mathematical theory of their behavior is presented: (*a*) the velocity of gas and air up the tube in the vicinity of the flame is const.; (*b*) the coeff. of the interdiffusion of the 2 gas streams is const.; (*c*) the interdiffusion is wholly radial; (*d*) the admixt. of the 2 streams occurs by diffusion only. Exptl. results are in excellent agreement with theory. H. L. OLIN

Bunsen flames of unusual structure. FRANCIS A. SMITH AND SAMUEL F. PICKERING. *Ind. Eng. Chem.* **20**, 1012–3(1928).—An abstract of a lecture illustrated with lantern slides showing unusual flame structures produced by varying combustion conditions, the causes for which have not been investigated. H. L. OLIN

Radiant energy from flames. W. E. GARNER. *Ind. Eng. Chem.* **20**, 1008–12 (1928).—Exptl. evidence relating to the character of emission from flames of CO is based on work involving the combustion of mixts. of CO with O_2, N_2 and H_2 in a closed tube with provision for the transmission of radiant energy through a fluorite window to a thermopile. In the case of the use of O_2 and N_2 the emissivity is definitely increased in spite of the lowering of temp. due to diln. With a 2% H_2 mixt. the radiation is diminished 7-fold. G. concludes that H_2 acts as a catalyst in the chem. sense at percentages above 0.2% and as a conserver of chem. energy within the flames up to 2%. This so called "*energo-thermic*" *catalysis* is brought about by collisions between protons or electrons and the newly formed products of combustion. H. L. OLIN

The flicker of luminous flames. D. S. CHAMBERLIN AND A. ROSE. *Ind. Eng. Chem.* **20**, 1013–6(1928).—The vibratory motion of luminous flames was studied by the photographic method and rate of vibration, speed of flame, movement and amplitude of vibration detd. for various gases under different conditions. The data show that the upper portion of the luminous zone rises to a max. height ten times per sec., and that this rate of vibration is not greatly affected by change in conditions. The lower portion of the flame has a continuous existence, but periodically gives off another flame, which rises above the main flame during its short period of existence. H. L. OLIN

Flame speed of hydrogen sulfide. D. S. CHAMBERLIN AND D. R. CLARKE. *Ind. Eng. Chem.* **20**, 1016–8(1928).—The speed of combustion of H_2S mixts. in a 2.5-cm. tube 1 m. long was detd. by means of the photographic method. The max. velocity was found to be 49.5 cm./sec. on burning 10.8% H_2S. H_2 is to a great extent oxidized selectively. Study of a continuous *method for producing* SO_3 by burning H_2S in an internal-combustion engine is proposed. H. L. OLIN

A colloid heat-indicator. RAPHAEL ED. LIESEGANG. Inst. physikal. Grundlagen der Medizin, Frankfort a. M. *Kolloid-Z.* **45**, 112–4(1928).—Certain alkaloids, when warmed with a sulfite soln., become turbid on account of the increase of alky. This reaction may be used to disclose the non-uniformity of temp. in the banded liquids described by Lloyd (*C. A.* **11**, 2532). J. H. PERRY

Measurement of e/m with a three-electrode valve with simultaneous measurement of its amplifying factor. DAULAT SINGH KOTHARI. *Indian J. Physics* **2**, 485–90 (1928).—Details are given of an arrangement by which the current in the anode circuit of a triode could be measured while known magnetic fields were applied by means of a Helmholtz coil. As the magnetic field was increased, the anode current at first remained almost const., then fell suddenly, and then decreased more gradually to zero. The computed results for e/m are much less than the accepted value. This is explained as due primarily to the effect of the grid. A method for computing the amplification factor from the exptl. results is discussed. W. W. STIFLER

Isotherms of monatomic substances and their binary mixtures. XXVI. Isotherms of helium at —183.0° and —201.5°, pressures from 3 to 8 atmospheres. G. P.

NIJHOFF AND W. H. KEESOM. *Verslag Akad. Wetenschappen Amsterdam* **36**, 1019–22 (1927).—Values are given for B_A of helium; they are compared with other detns. **XXVII. Isotherms of helium between —103.6° and —259.0° at pressures of 1.5 to 14 atmospheres.** G. P. NIJHOFF, W. H. KEESOM AND B. ILIIN. *Ibid* 1023–4.—Consts. for He were detd. at —103.29°, —146.50°, —224.94°, —235.77°, —249.80°, —252.57°, —255.845° and —258.99°. B. J. C. VAN DER HOEVEN

Isotherms of diatomic gases and their binary mixtures. XXXV. Isotherms of hydrogen at temperatures ranging from —225.5° to —248.3° and pressures running from 1.6 to 4.2 atmospheres. G. P. NIJHOFF AND W. H. KEESOM. *Verslag Akad Wetenschappen Amsterdam* **37**, 35–6(1928); cf. *C. A.* **22**, 2861.—pv_A has been measured for various pressures and compared with the theoretical values. From this it was calcd. that if the temps. are —225.54°, —231.52°, —236.56°, —241.84°, —248.32°, the corresponding values of $B_A \times 10^3$ are —0.268, —0.309, —0.340, —0.390 and —0.439. A. L. HENNE

Metal-metal oxide electrodes. F. J. WATSON. Imperial College of Sci. and Tech. London. *Chem. Eng. Mining Rev.* **20**, 172–5(1928).—Metal-metal oxide electrodes do not alter the compn. of the soln. and are well adapted for the continuous recording of p_H. They act well in the alk. region where quinhydrone is useless, though the p_H at which the hydroxide commences to be neutralized limits their use on the acid side. A calibration curve for each combination has to be established by comparison with the H electrode in a series of buffer solns. Applications of the W and Pt-Mn_2O_3 electrodes in the *sugar industry, control of boiler feed H_2O and treatment of sewage* are discussed. E. G. VANDEN BOSCHE

Recent investigations on cells contradicting the second principle of thermodynamics. VASILESCO KARPEN. *Compt. rend.* **187**, 418–20(1928).—The cells studied consisted of electrodes of Pt and C in solns. of NaOH. At high concns. C is pos. and becomes neg. at lower concns. With pure H_2O the e. m. f. is about 0.1 v. but there is no reaction to account for this. Values for $W = E_m - T_m \Delta E/\Delta t$ vary from —0.830 v. to —1.806 v. for the temps. 28° to 71° and 71° to 96°. E. G. VANDEN BOSCHE

The diffusion of a hydrogen potential or a reduction potential through platinum or palladium. REINHARD KÖHLER. *Z. physik. Chem.* **135**, 369–82(1928).—Expts. on Pt crucibles of from 0.05 mm. to 0.1 mm. wall thickness show that the H_2 potential produced on the outside by electrolytic pptn. at room temp. proceeds to the inside of the crucible only very slowly. The time necessary for a given change of the inner potential varies approx. with the square of the plate thickness, provided the potential change does not exceed 80 mv. The diffusion of H_2 through Pd only corresponded as a first approximation to the diffusion law, results agreeing with Nernst and Lessing. The effect of the reduction potential on the diffusibility was studied with thin Pd plates (0.02 mm.) for $CrCl_3$, K cobalticyanide, NH_4Cl-$FeSO_4$, $SnCl_2$, hydrazine, Na_2S, $K_3Fe(CN)_6$, $FeSO_4$, $FeCl_2$, pyrogallol and hydroxylamine. The diffusion effect is in general greater the greater the reduction potential calcd. from the N H-ion concn. M. R. FENSKE

The reduction potential of cysteine. L. MICHAELIS AND L. FLEXNER. *Naturwissenschaften* **16**, 688–90(1928).—Cysteine-cystine mixts. do not show an ordinary reduction-oxidation potential, depending on relative concn. and p_H; the system is not a reversible one. However, Dixon and Quastel's observations of a potential $E = E_0 + (RT/F \ln [H^+]/[\text{cysteine}])$ on solid gold electrodes if measured rapidly were confirmed, E_0 varying more than 50 milliv., depending on the individual gold electrodes. For Hg electrodes E_0 was 200 milliv. more negative. They explained it by the inability of cystine to take up H from the metal and difference in H overpotential of the latter. It was now found that on careful removal of traces of O the reduction potential of cysteine is equal for Pt, gold-plated Pt and Hg electrodes. Solid gold is the only abnormal metal; it gives false equilibria. The establishment of equil. takes for Pt several hrs., longer even for Au, shorter for Hg. N_2 or H_2 atm. does not influence the value of the potential. The O was removed from the soln. by passing through purified (Cu at 600°) N_2 excluding rubber tubing. O_2 addn. of 1:40,000 upset the equil. on Pt, giving a more positive potential. The D. and Q. equation was found to hold, E_0 being —0.001 v. relative to the normal H electrode at 38°, accuracy ±0.002 v. The concn. range examd. was for cysteine 0.1 to 0.0002 M, p_H from 2 to 8. No explanation of the effect is offered. B. J. C. VAN DER HOEVEN

The electrokinetic potential between the solid and liquid states of a single substance. FRED FAIRBROTHER AND FRANK WORMWELL. Univ. of Manchester. *J. Chem. Soc.* **1928**, 1991–7.—The production of an elec. charge by the friction of a liquid against the same substance in the solid state was investigated by a cataphoresis method.

The movement of a small rod of the solid suspended in the liquid at a temp. within a few degrees of the melting point and between 2 Pt electrodes was measured with a microscope. The solid was found to be positively charged in all cases except in C_6H_6 and o-ClC_6H_4OH, in which cases no deflection could be observed. Substances showing deflections were H_2O, AcPh, $PhNO_2$, guaiacol, anethole, o- and p-$CH_3C_6H_4OH$ and o-$C_6H_4ClNO_2$. The deflection is greatest in H_2O and AcPh. The authors conclude that it is only with polar compds. that the effect is observable, and that it is greater the more polar is the substance. If, according to Coehn's rule, the phase with higher dielectric const. should become positively charged, the results agree with the work of Errera (*C. A.* **22**, 2305) in that the dielectric const. of a polar substance is higher in the solid state than in the liquid state. H. F. Johnstone

Alteration in the galvanic potential of metals, in color and in resistance of gold-silver-copper alloys on cold working. G. Tammann and C. Wilson. Göttingen Univ. *Z. anorg. allgem. Chem* **173**, 156–63(1928).—Hard metals are generally less noble than when soft, though in 2 out of 9 cases the reverse was true. If the p. d. between a hard and a soft piece of metal is due to the difference in the condition of the outer surface then when the externally hardened surface of the metal rubbed with emery is removed by soln., zero e. m. f. is to be expected. This was found to be the case. Heating a piece of Cu which had been rubbed with emery removes the potential due to the less noble surface. Cold working such alloys as are characterized by certain colors renders them more yellow. On reheating, the color disappears and at the temp. of heating the elec. resistance also diminishes and whiter tones ensue. S. L. B. Etherton

The conductivity and p_H values of mixtures of acids in solutions. J. A. Cranston and J. Duncan. *J. Roy. Tech. Coll. Glasgow* **4**, 41–7(1927).—A study of the changes in p_H and elec. cond. accompanying the replacement of water in a HCl soln. by acetic, citric, tartaric, oxalic and phosphoric acids. As the concn. of acetic, citric and tartaric acids in the soln. increases, the elec. cond. decreases but the H-ion concn. detd. by the e. m. f. method increases. In the case of the other 2 acids this effect is not so marked. The influence of the concn. of the HCl is also studied. If H_3PO_4 is added to solns. of HCl greater than 1 *N*, decrease in cond. results. If the HCl is less than 1 *N*, the cond. increases with addn. of H_3PO_4. These effects are discussed briefly along with the meaning of the terms "viscosity" and "concn. of ions" R. E. Gibson

Electrical conductivity of solid sulfide mixtures. P. Fischer. *Z. Elektrochem.* **33**, 571–7(1927).—Following work on mixtures of salts and of oxides (*C. A.* **20**, 2276; **21**, 693), the elec. cond. of compressed mixts. of powdered sulfides has been detd. for direct and for a. c. at various temps. For mixts. of two sulfides the cond. does not vary in a simple manner with the percentage compn. of the mixt. With Ag_2S and PbS the cond. increases with increasing proportion of PbS, but eventually reaches a max. at about 90% PbS. Although the cond. of Ag_2S is essentially electrolytic and that of PbS electronic, migration expts. on a 50% mixt. indicate that only about 1% of the cond. is electrolytic. For mixts. of Ag_2S with FeS, which is practically a non-conductor, the cond.-compn. curve exhibits a min. and a max. Mixts. of FeS and PbS are practically non-conducting up to 50% PbS, but with higher proportions the cond. increases rapidly. Mixts. contg. sulfides of Cu, Zn, Cd and Ba were also examd. It appears that the type of cond. exhibited by a solid substance may be modified by certain conditions. The observed phenomena are attributed to distortion of the crystal lattices and electron orbits as a result of compression. B. C. A.

Electrical conductivity in solid sodium chloride at room temperature. J. Gingold. *Z. Physik* **50**, 633–43(1928).—G. tested natural crystals produced by cleavage, artificially grown crystals and pressed pastilles for cond. and for charging and discharging currents as condensers. For const. potential in each case the cond. decreases with time. The phenomena are best explained by assuming that current passage requires spatial deformation of crystal lattice to permit ionic movement. A perfect crystal lattice such as is most nearly approached in the natural crystal is most difficult to deform and accounts for initially low and decreasing cond. Artificially grown crysts. contain more imperfections and hence show greater cond. A. P. Sachs

The electrical conductivity of tellurium and of liquid mixtures of tellurium and sulfur. Charles A. Kraus and Ernest W. Johnson. Brown Univ. *J. Phys. Chem* **32**, 1281–93(1928).—The purpose was to det. the influence of varying amts. of the nonconductive S on the elec. cond. of the highly conductive metallic Te. *Special types of cond. cells for measuring the resistances of liquid mixts. at high temps.* as well as a *const.-vol. gas thermometer* for use as a high-temp. regulating device are described. The log of the sp. resistance decreases approx. linearly as the temp. increases for mixts. of Te and S as well as for pure Te. The values for the sp. resistance at 400° for several

mixts. are as follows: Pure Te, 6.41×10^{-4}; 5 at. % S, 8.910×10^{-4}; 15 at. % S, 5.741×10^{-3}; 30 at. % S, 2.390×10^{-1}; 50 at. % S, 1.571×10; 70 at. % S, 1.870×10^{3}; 85 at. % S, 2.317×10^{5}. Beginning at 30 at. % S and at higher S concns., polarization effects become marked, indicating the presence of ordinary ions. The ionization of Te diminishes rapidly with increasing S content. The metallic properties due to Te are evidently lost when the no. of S atoms in the mixt. becomes equal to, or slightly greater than, the no. of Te atoms. The sp. resistance of liquid Te at its melting pt. is about $^1/_{16}$ that of solid Te at the same temp.; at 500° the value for the former is about $^1/_6$ that of Hg at ordinary temps. H. F. JOHNSTONE

Electrical conductivity of palladium in a vacuum and in different gases. A. PUODZIUKYNAS. *Z. Physik* **46**, 253-70(1927).—The cond. of untreated Pd wire increases by about 15% when the gas contained in the metal is removed by ionic bombardment in a vacuum; the increase in cond. was proportional to the amt. of gas removed, and the total amt. of gas evolved was approx. 300 times the vol. of the wire. After treatment for 50 min. at bright red heat in pure H the cond. fell by 50% and 1486 vols. of gas were absorbed. When the wire was maintained in H at 1 atm. its cond. rose slowly, and more rapidly if the wire was in a vacuum until about 900 vols. of gas had been evolved; this indicates that after glowing in hydrogen the metal is supersatd. with H. When the gas is removed by heating in a vacuum the wire absorbs H slowly and N not at all; if, however, the gas is removed in the cold the wire becomes activated and absorbs approx. the same amt. of N or H. B. C. A.

The electric conductivity of kerosene and gasoline as a function of the temperature. C. A. MOREHOUSE. Ia. State Col., Ames. *Proc. Iowa Acad. Sci.* **34**, 271-2(1927), cf. *C. A.* **20**, 333.—Kerosene was put into a glass cond. cell heated by a home-made heating coil. This cell was connected in series with an electroscope. The electroscope was then charged through the kerosene by means of an electrophorus and the time required for the leaf to fall through 10 divisions on the scale was taken by means of a stop-watch. This arrangement worked very satisfactorily for the kerosene. A curve is plotted which shows that the resistance of the kerosene decreases steadily with a rise in temp. resulting in the following equation of consts.: $R_t = 290.53\ (1 - 0.0161t + 0.000068t^2)$. In applying this method to gasoline the resistance was so low that the deflection of the leaf was too rapid to be measured with a stop-watch. But by charging a condenser through gasoline and then discharging it through a galvanometer it was found that its resistance decreases very rapidly with an increase of temp.

W. G. GAESSLER

The theory of superconductivity. L. KORDYSCH. *Ukrainische Phys. Abh.* **1**, 56-69(1926); *Phys Ber.* **8**, 931(1927).—The ohmic resistance R arises from the opposing action of ions on each other, and the magnetic component of resistance may be neglected. The energy of the electromagnetic field is related to electron displacement. The supercond. begins when the probability η_1 that an electron is captured by a given ion is zero. The self-induction L_1 and η are related by $L = m/[e^2N(1 - \eta)]$, where e is the charge and m the mass of the electron and N is the Loschmidt no. The sp. cond. σ is given by $\sigma = {}^1/_2(e^2/m)\ (1 - \eta)/\eta$. The dependence of η on T is given by $\eta = kT/3bm$. G. L. CLARK

Electromotive force due to friction between various metals. A. LAFAY. *Compt. rend.* **186**, 133-4(1928); *Science Abstracts* **31A**, 404.—When one metal is rubbed on another their point of contact becomes the seat of an e. m. f., due partly to the contact of the two metals and partly to the rise of temp. caused by the friction. The two effects are usually in opposition, and the effect due to heat can easily be eliminated or allowed for. By giving one of the metals the form of a disk rotated at a known speed, and pressing the other metal on the rim of the disk, it is found that the e. m. f. produced is proportional to the relative speed of the two substances and is independent of the pressure which keeps them in contact. If the relative speed is V, then for speeds between 0 and 8 m. per sec. the e. m. f. of friction between Ag and polished steel is $8 \times 10^{-3}V$ v., and that between Cu and steel is $0.16 \times 10^{-3}V$ v. Also for a given value of V the e. m. f. observed is unaltered for a variation of pressure between 10 and 200 g. per sq. mm. H. G.

The reduction of oxygen at the dropping mercury cathode. J. HEYROVSKÝ. Charles Univ., Prague. *Časopis Československého Lékárnictwa* **7**, 242-51(1927).—With the polarographic arrangement and by means of the dropping Hg cathode, the elec. reduction of atm. O_2 dissolved in aq. solns. can be followed in a quant. manner. The expts. carried out with dil. solns. of electrolytes, exposed to the air, lead to the following conclusions: (1) O_2 is first reduced to H_2O_2 at a potential equal to about that of normal Hg_2Cl_2 electrode, the influence of p_H upon this reduction potential being very small,

(2) the second stage is the elec. reduction to H_2O; this occurs at a 0.001 *N* concn. of H ions at a potential of —0.60 v. and is shifted to more negative values according to the formula $(RT/4F)\log[O_2].[H^+]^4$; (3) a quant. detn. of the content of O_2 and H_2O_2 in solns. may be made from the dimensions and positions of waves on the polarization curves; (4) well-pronounced maxima due to interfacial absorption of O_2 are shown on the current-voltage curves; these may be suppressed by small addns. of surface-active matter (*e. g.*, sulfosalicylic acid and org. dyes) or by high concns. of electrolytes.

WILLIAM J. HUSA

Electromotive force of flowing (aqueous solutions in glass tubes), and stability of colloids. II. H. R. KRUYT AND P. C. VAN DER WILLIGEN. Utrecht Univ. *Kolloid-Z.* **45**, 307–19(1928).—K. and W. take as a measure of the capacity for various electrolytes to ppt. colloids, the e. m. f. set up by the flow of their soln. through a glass capillary. In the alkali series, the capacity increases from Li^+ to Cs^+, and that of $MgCl_2$ is greater than that of $BaCl_2$. HCl is about as effective as $BaCl_2$. Of the following tervalent ions: Ce, La, $Co(NH_3)_6$ and Al, the last produces the same e. m. f. at about one-hundredth of the concn. of the others. This is not caused by hydrolysis. $ThCl_4$, Pt^{+4} and 2 Co complexes, quadrivalent and sexivalent, were also tested. The e. m. f. of K is not affected by the anion, except in the case of OH, which raised the e. m. f. greatly. KOH shows the same increase in quartz and in Jena glass capillaries. The difference in e. m. f. of the various ions is attributed to differences in the charge of hydrated ions. The e. m. f. of pure H_2O could not be detd. because it is affected by too many factors.

G. CALINGAERT

Oxidation-reduction potentials of the pentacyano-ferroates. DAVID DAVIDSON. Stanford Univ. *J. Am. Chem. Soc.* **50**, 2622–30(1928).—The oxidation-reduction potentials (against the *N* Hg_2Cl_2 electrode) of the following salt mixts. in *N* KCl at 21° were: $K_4Fe(CN)_6$-$K_3Fe(CN)_6$, 0.198 v.; $Na_3Fe(CN)_5.NH_3$-$Na_2Fe(CN)_5.NH_3$, 0.092 v.; $Na_3Fe(CN)_5.H_2O$-$Na_2Fe(CN)_5.H_2O$, 0.209 v.; $Na_4Fe(CN)_5NO_2$-$Na_2Fe(CN)_5$-NO, 0.231 v. Variations of potentials from the theoretical electrochem. law indicated the formation of the compd. *2$Na_2Fe(CN)_5.H_2O$.3$Na_3Fe(CN)_5.H_2O$.* D. D.

Electrometric titration curves for dibasic acids. I. Normal acids. RICHARD GANE AND CHRISTOPHER KELK INGOLD. Univ. Leeds. *J. Chem. Soc.* **1928**, 1594–1600.—The purpose was to test by some phys. method the hypothesis that the angles between the valences of a C atom are modified by the space requirements of the attached groups. The method of dissocn. consts. of acids was used and the formulation of Bjerrum was adopted to give *r*, the distance between the ionizing groups. By the method of Auerbach and Smolczyk (*C. A.* **19**, 222) the 2 dissocn. consts. were obtained. The acids studied were of the type $CO_2H(CH_2)_n.CO_2H$, from oxalic to azelaic. For the acids from glutaric to azelaic the equation $r = 4.4 + 1.73n$ closely approximates the observed values. The increase per methylene group in the length of the C chain is then about 1.73 A. U.

M. R. FENSKE

The determination of sodium-ion concentration by a sodium amalgam electrode. G. ETTISCH AND K. JOACHIMSOHN. Kaiser Wilhelm Inst., Berlin. *Z. Elektrochem.* **34**, 404–6(1928).—Describes an electrode vessel for use with alkali metal amalgams in cells of the type, *X* amalgam | *X* salt soln. | satd. KCl | Hg_2Cl_2 electrode. The article gives full details with illustrations and also describes an app. for prepg. pure amalgams. An attractive feature is the good use made of ground-glass joints for connecting the various pieces of app. The electrode was tested with Na and NaCl and the observed and calcd. results agreed most satisfactorily.

R. E. GIBSON

The relation between current density and current efficiency in the process of persulfate formation. O. A. ESIN AND E. I. KRUILOV. *Ann. inst. polytech. Oural* **6**, 221–30(1927); cf. *C. A.* **21**, 1935.—Further expts. fully confirm the earlier results of the author.

G. B. KISTIAKOWSKY

The oxidation potential of the quinquevalent-tervalent columbium system. II. SAMUEL J. KIEHL AND DAVID HART. *J. Am. Chem. Soc.* **50**, 2337–45(1928).—The oxidation potentials of the Cb^V-Cb^{III} system were measured with a Hg electrode in an atm. of H at 25°. The av. normal electrode potentials, calcd. from the relation $E = E_0 - 0.0295 \log [Cb^{+++}]/[Cb^{+++++}]$ for the 3 concns. of H_2SO_4 used were —0.3730, —0.3849 and —0.4261 v.

H. R. MOORE

Investigations on the electrolytic oxidation of organic compounds. C. MARIE AND G. LEJEUNE. *Compt. rend.* **187**, 343–4(1928).—In oxidizing alcs. with a Ni anode and in alk. medium, there is but slight depolarization and electrolysis begins at 1.5 v. With Au and H_2SO_4 the result is similar, but with Au and NaOH electrolysis begins at 1.1 v. and after a short time rises to 1.6 v. With Pt and NaOH electrolysis begins at 0.7 v., stops and begins again at 1.6 v. With Pt in acid medium it begins

at 0.7 v., stops and begins again at 1.1 v. To limit the oxidation of the alc. to aldehyde, the lower values should be maintained. This is done by increasing the alc. concn. or by slight interruptions in the electrolysis. E. G. VANDEN BOSCHE

Metal overvoltage measurements with the cathode-ray oscillograph. EDGAR NEWBERY. Univ. of Capetown. *Proc. Roy. Soc.* (London) **A119**, 680–6(1928); cf. *C. A.* **11**, 2640; **21**, 1405.—N. has repeated his measurements of metal overvoltage using the cathode-ray oscillograph in an effort to check his previous results and hence meet the objections to his previous work with the rotating commutator, and has also provided further data for the soln. of the problem of the origin of transfer resistance. Electrodes of Cu, Ag, Zn, Cd, Hg, Pb, Fe, Ni and Co were used with normal solutions of the corresponding sulfates except for Ag, Pb and Hg with which the nitrates were used. A metal overvoltage of nearly zero was obtained for the first 4 metals, checking previous results He concludes that when only metal is being deposited there is no metal overvoltage and no transfer resistance. Entirely different results were obtained for the overvoltage of Fe, Co and Ni These correspond in magnitude to that of a soln. of acid where H_2 is deposited, therefore, the overvoltage measured is that of H_2 and not that of the metal. This is assumed to be due to hydration of the ions of these metals. A. J KING

The effect of hydrogen-ion concentration on overpotential. F. P. BOWDEN. Lab. of Phys. Chem Cambridge, England. *Trans Faraday Soc.* **24**, 473–86(1928) —The overpotential of H ions was detd. for buffered and unbuffered solns in which there was no dissolved O_2 at current densities from 10^{-8} to 10^{-3} amps /sq. cm. By plotting the overpotential against the log of the c. d. the curves obtained were for each soln 2 straight lines with the break at about an overpotential of 0.9 v. Part 1 of the curve was the same for all solns., showing that in this range of current densities, the overpotential was independent of the H-ion concn. The slope is about 0.120 and the equation of the line is $\eta = a_1 + b \log i$, where η is the H overpotential and i is the current density. For part 2 the overpotential increases with decreasing H-ion concn., the shift being about 58 millivolts for every tenfold decrease in the H-ion concn. The primary process in part 2 is the deposition of H ions, since the shift is dependent only on the H-ion concn and not on the compn. of the soln. In dil. unbuffered solns the observed shift in overpotential is greater than calcd., probably because of concn polarization. The equation for part 2 lines is $\eta = a_2 + 2b - \log i$ The slope is about 0 220. Frequently the c d may be reduced when above the break without reverting to slope 1. The disagreement between various authors is probably due to their being on the 2 different lines The exptl. work was checked by detns. with a dropping cathode, the c d. and overpotential being taken at the largest size of the drop. There is no special significance to the terms "hydrogen deposition potential" and "minimum potential." A F.

The method of current density-voltage measurement. ARMIN DADIEU. *Z Elektrochem.* **34**, 301–5(1928).—A discussion of the standard method of c. d.-voltage curves as applied to decompn. potential of fused salts and non -aq solns It is shown that in many instances it is preferable to det. the c. d.-voltage curve in the direction of decreasing c. d. By this means breaks in the curve due to unstable or complex electrode products are avoided and more dependable values of the decompn. potential are obtained. The advantages of this method are: (1) in cases where the normal method affords no exact values of the decompn. point, exact values can be obtained; and (2) in cases where a metal fails to deposit in the normal manner the conditions of this method sometimes make the deposition possible; and (3) fewer points need to be detd. W. J. SWEENEY

The theoretical potential of the alkaline earth metals. G. DEVOTO. Ist. chimica industriale, Milano. *Z. Elektrochem.* **34**, 19–22(1928).—The standard potential M^{++}/M has been calcd. thermodynamically for M = Ca, Sr, Ba and Mg. The values are 2.897, 2.945, 2.956 and 2.353 v., resp., in good agreement with the expts. of Cambi and Devoto with molten salts (*C. A.* **21**, 2837; **22**, 1716). A. L. HENNE

The extrapolation of electromotive force measurements to unit ionic activity. DAVID I. HITCHCOCK. Yale Univ. *J. Am. Chem. Soc.* **20**, 2076–9(1928).—With a partially expanded form of the Debye-Hückel equation, namely,—$\log \gamma = 0.5\,m - Bm$, where B is an addnl. const., e. m. f. *versus* molality curves are obtained which deviate from straight lines only slightly above $0.02 \cdot M$. The extrapolated E_0 values for HCl at 20°, 25° and 30° are 0.2253, 0.2223 and 0.2193 v., resp. This method checks with all data except those for 25° below 0.003 M. H. R. MOORE

The theory of passivity phenomenon. II. The relation between passivity, current density and time. WOLF JOHANNES MÜLLER AND OTTO LÖWY. Techn. Hochschule, Wien. *Monatsh.* **49**, 46–74(1928); cf. *C. A.* **22**, 3090.—The formula $t_p = B(i_0)^{-m}/(F_0)$

is obtained from the theory of covering polarization and gives a straight line when the passivity time and the c. d. are plotted logarithmically. The earlier work of W. J. Muller (*C. A.* **22**, 347) giving values of the passivity time and av. c. d. for Fe, Ni, Zn, and Cr shows that this relationship is in good agreement for these 4 metals. Accurate investigations with Fe in different electrolytes at const temp. show that this relationship is valid for H_2SO_4 contg. ferrous-ferric sulfate as well as for *N* H_2SO_4. Studies with freely suspended and rotating electrodes give the theoretically expected effect. In electrolytes satd. with $FeSO_4$, passivity began first on the freely suspended electrode at a somewhat higher c d. than for the protected electrode and the passivity time was longer than for the protected electrodes. At higher c. ds. the time interval was less.
M. R. FENSKE

The electron theory of metals according to the wave mechanic statistics, especially as applied to the question of the Volta effect. A. SOMMERFELD. *Ber.* **61B**, 1171–80 (1928).—An address before the Deut. chem. Gesellschaft, presenting in a somewhat popular form the significance of the new wave-mechanics theory. Special prominence is given to the new results by G. P. Thomson, showing that cathode rays produce interference patterns by passing through metal foil or celluloid exactly like the diffraction patterns obtained with x-rays. Metals occupy an especially interesting place since the existence of free electrons is involved It is established according to recent calcns that in the close packing of metal atoms the outer electrons assume an unstable condition and become loosened from the mother atom In this way it may be predicted which atoms will possess metallic character in the solid state. In order to understand the properties of the free electrons in the interior and on the surface, the newest wave mechanics theories are used. These methods describe the statistical properties of the electrons in as complete and simple a fashion as the wave theory of light explains the phenomena of optics and x-rays. It is most promising that these most recent phys. theories have such valuable and useful chem. applications. G. L. CLARK

The magnetic double refraction of liquid mixtures. G. SZIVESSY AND M. RICHARTZ. Univ. Munster. *Ann. Physik* **86**, 393–421(1928).—The magnetic double refraction of 13 different binary mixts. was detd as a function of the vol. concns. of the components The observed values are uniformly smaller than those predicted from Langevin's orientation theory. H. R MOORE

The theory of the Kerr and Faraday effects in gases. II. The quadratic effect. R DE L. KRONIG. *Z. Physik* **47**, 702–11(1928).—Using the method of *C. A.* **22**, 521 and extending it to cover the quadratic terms in the effect, equations are derived giving the Kerr and Faraday effects for diatomic mols , in terms of the quantum number of the absorption bands and known consts The equations agree in form with the empirical equations. They predict in agreement with expt. no linear Kerr effect. They agree in order of magnitude with measured values for the Faraday effect the small discrepancy being due, it is supposed, to the neglect of the continuous absorption of gases used. A new, simple relation between the Verdet const. for the Faraday effect and the Kerr const. is derived. Exptl. data are as yet not available to check this relation. F. R. B.

The dielectric constants of binary mixtures. VII. The electric moments of certain diphenyl derivatives. Their relation to the several structures. JOHN W. WILLIAMS AND ARNOLD WEISSBERGER. Leipzig Univ. *J. Am. Chem. Soc.* **50**, 2332–6(1928); cf *C. A.* **22**, 1528.—The elec. moments of derivs. of diphenyl as well as *p*-phenylenediamine are detd from dielec. const. and d. data of dil solns. at 25°. The elec. moments of *p*-dichlorobenzene, 4,4′-dichlorodiphenyl, *p*-dinitrobenzene and 4,4′-dinitrodiphenyl are zero, but the introduction of single Cl or NO_2 groups results in highly unsymmetrical mols. with high elec. moments. For the dinitro and dihydroxy derivs. the data suggest an open or extended structure of the benzene nuclei, while in the amino or benzidine type the rings are folded. **VIII. The electric moment as a vector quantity.** JOHN W. WILLIAMS. *Ibid* 2350–7.—Dielec. and d. data have been obtained for various derivs. of benzene, contg pos. substituents such as CH_3, and neg. as OH and NO_2. These substituent atoms or groups may be considered as vectors acting in certain directions. For di-substituted compds. the resultant moment is to a certain extent calculable from the formulas of Thomson (*C. A.* **18**, 17) on the assumption of no interaction between the 2 groups. Good agreement is obtained for mols. with simple substituents, while the disparity shown with the heavier and more complex radicals suggests the need of 3 dimensional diagrams permitting interaction between the various groups. The data support the plane formula for the *benzene mol.*
H. R. MOORE

Dielectric constants of solutions of electrolytes. H. HELLMANN AND H. ZAHN.

Z. physik. Chem. **132,** 399–400(1928).—Polemical (cf. Walden, Werner and Ulich, *C. A.* **22,** 1718). H. G.

Dielectric constants of electrolytic solutions. H. Hellmann and H. Zahn. *Ann. Physik* **86,** 687–716(1928); cf. preceding abstract.—This is a detailed reply to a series of articles of similar title by P. Walden, H. Ulich and O. Werner (cf. *C. A.* **22,** 1718). The resonance method and various exptl. details are discussed critically at considerable length. W. W. Stifler

Dielectric constants and absorption indices of ethyl alcohol for short electric waves. San-Ichiro Mizushima. Tokyo Imp. Univ. *Proc. Imp. Acad.* **4,** 205–7(1928).—The dielec. const. and absorption index of EtOH were detd. between —60° and 60° by the resonance method, using elec. waves of wave length 59 cm. These and previous results for other wave lengths show that the region of anomalous dispersion is shifted toward longer wave lengths as the temp. is lowered. This agrees with Debye's dipole theory. From the exptl. values for the dielec. const., and by making use of Debye's formula, the mol. radius can be calcd. It is found to be 2.1×10^{-8} cm., which is in good agreement with the value obtained by other methods. C. J. West

The relation between the dielectric constant of helium and the temperature. M. Wolfke and W. H. Keesom. Univ. Leiden. *Verslag Akad. Wetenschappen Amsterdam* **37,** 533–9(1928); cf. *ibid* **36,** 1204(1927).—The measurements of the dielec. const. of liquid He were made in the app. previously described and improved on. The break in the $\epsilon - T$ curve is at 2.295° abs. and 38.65 mm. pressure for the triple point of liquid helium I and II with vapor. At that point the ϵ value found is 1.05594. From Onnes and Boks' values for the d. of liquid helium the polarization of liquid He between 2.05° and 4.19° abs. is calcd. by the Clausius-Mosotti equation to be 0.1241 to 1.1253, av. 0.1246, *i. e.*, practically const. and the same for I and II. From optical data on He gas follows for the polarization of the latter 0.1292. It is concluded that the He mol. in liquid I and II and in the vapor is the same. B. J. C v. d. H.

Thermal variation of magnetic rotatory power when the magnetization coefficient is positive and independent of temperature. H. Ollivier. *Compt. rend.* **186,** 1001–3 (1928).—Paramagnetic substances may be classified according as they obey Curie's, Weiss', or other similar laws, or have paramagnetism independent of the temp. Becquerel showed that, according to Langevin's theory of the orientation of paramagnetic atoms in a field, paramagnetic rotation of the plane of polarization occurs, which is proportional to the coeff. of mass magnetization. Assuming the simple additive law expressing this in terms of Verdet's constant, the variation in magnetic potential, and the observed rotation, it is shown for $Na_2Cr_2O_7$—a compd. shown by Weiss and Collet (*C. A.* **20,** 1170, 2781) to have a constant paramagnetism—that Verdet's const (referred to unit mass) is independent of temp. between 7° and 61°. A soln. of I-free ZnI_2 (d^0 2.482) was found preferable to CS_2 as a comparison substance. It has a Verdet const. 1.36 times as great at 16°, with yellow or Hg green light. It is transparent up to $\lambda 0.3\mu$ B. C. A.

Theory of ferromagnetism. W. Heisenberg. *Z. Physik* **49,** 619–36(1928).—An attempt is made to explain the Weiss mol. field on the basis of a quantum mechanics energy-interchange process similar to that recently applied by Heitler and London to the interpretation of homopolar valence forces. According to this, ferromagnetism is possible only (1) when the lattice is such that each atom has at least 8 neighbors, and (2) the principal quantum no. of the electrons responsible for the magnetism must be $\lesssim 23$. These conditions together do not serve to distinguish Fe, Ni and Co from all the other materials but Fe, Ni and Co satisfy these conditions. The present paper is therefore regarded by H. as preliminary and further development is promised. W. W. Stifler

The magnetic susceptibility of the iron salts from Wildbader thermal waters and other mineral springs. Gaisser. *Metallbörse* **17,** 1603; *Chem. Zentr.* **1927,** II, 1462.—A proof for the magnetic susceptibility of the Fe salts is the reaction with benzidine-HCl and H_2O_2. G. does not recommend the use of these reagents to detect catalytic action of waters since various definitely catalytic waters do not give the reaction. The p_H is important for successfully carrying out the reaction. When it becomes too high the reaction becomes negative. The mountain springs at Cannstadt and the brook springs at Teinach gave positive reactions. All other springs which were investigated gave negative reactions. J. S. Reichert

Application of thermomagnetic analysis to the chemistry of iron. J. Huggett, H. Forestier and G. Chaudron. *Chimie & industrie* Special No., 588–91(April, 1928).—The previously described (*C. A.* **20,** 1939) app. for thermomagnetic analysis has been modified so as to permit recording the displacement of the luminous spot

The possible applications of the instrument are discussed by reviewing the results obtained with it to date (*C. A.* **20**, 1939; **21**, 1218; **22**, 1934). A. P.-C.

The magnetization of single crystals of nickel. SEIJI KAYA. *Sci. Repts. Tôhoku Imp. Univ.*, 1st ser., **17**, 639–63(1928); cf. *C. A.* **22**, 907.—Crystals of electrolytic Ni 7 cm. long and 2.3 cm. in diam. were prepd. by moving a long crucible, contg. molten Ni, out of the furnace as slowly as the metal froze. They were filed into the form of oblate ellipsoids with the equatorial planes parallel, resp., to the 3 planes (100), (110), and (111). The magnetization curves in various directions through the crystals are illustrated and discussed. The permeability was much increased by annealing. The crystals appeared isotropic up to a magnetization intensity of 205, but above that, the magnetizability decreased from the trigonal to the digonal to the tetragonal axes. The parallel and perpendicular components of magnetization for a const. field varied periodically in a given plane according to the form of space-lattice. The amplitude of this variation was greatest in the (110) and least in the (111) plane. G. F. C.

Determination of the magnetic saturation of iron carbide. F. STÄBLEIN AND K. SCHROETER. *Z. anorg. allgem. Chem.* **174**, 193–215(1928).—A ballistic method for finding the satn. value of the intensity of magnetization is described in detail, including the calibration of the app. and the exptl. detn. of the various corrections necessary. A large Weiss type of electromagnet was used to furnish the necessary fields. A preliminary investigation was made with pulverized specimens for which the satn. values had already been detd. in solid form. The results indicated that the method could be relied upon for powders. Fe_3C was prepd. from pig Fe by soln. in 0.1 *N* cold H_2SO_4. Tests on this gave 12,400 gausses as the satn. value for $4\pi J$, where J is the intensity of magnetization. By extrapolation from 2 specimens of C steel contg. 0.46% and 0.95% of C, resp., an av. value of 12,300 gausses was obtained. S. and S., therefore, conclude that the most probable value for satn. is $4\pi J = 12{,}350$ gausses. W. W. S.

Magnetic properties of cobalt. MARGARETE SAMUEL. *Ann. Physik* **86**, 798–824 (1928).—Two specimens of Co, approx. 18 cm. long and 0.8 cm. in diam., were studied by the magnetometric method. One contained approx. 1.33% Fe, the other 1.5% Fe; both contained traces (less than 0.1%) of C, Mn, Ni and Si. The usual magnetization curves, ideal magnetization curves, reversible permeability and coercive force as a function of the temp. between —185° and 400° are given for each specimen. In spite of careful preliminary annealing, the results for the 2 specimens are not in agreement. At $H = 700$ gausses one gave 773 as the magnetization while the other gave 1086. Similarly, although in each case the reversible permeability decreases with increasing magnetization, for one specimen the values lie between 24 and 9, while the corresponding limits for the other are 86 and 6. Contrary to the observations of O. Bloch that heating Co above 700° produces magnetic hardening, S. found no appreciable alteration in magnetic properties after heating to 1000°. However, in one of the specimens a distinct magnetic hardening was observed after chilling in liquid air. The Gans law of magnetic corresponding states does not seem to hold for these specimens.
W. W. STIFLER

Magnetic susceptibility of ozonides. V. I. VAIDYANATHAN. *Indian J. Physics* **2**, 421–33(1928); cf. *C. A.* **21**, 1921.—The magnetic susceptibilities of 5 typical ozonides were measured by a modified Curie balance. The special precautions made necessary by the explosive nature of the ozonides, both in their prepn. and during the measurements, are described. All were found to be diamagnetic. The susceptibility of the O_3 mol., computed from the exptl. results on the assumption of the validity of Pascal's additive law, is approx. -25×10^{-6} per g. mol. The electron arrangement in the O_3 mol. is discussed at some length and a possible structure for it is suggested which leads to results in general agreement with those obtained experimentally. W. W. S.

Magneto-electrolytic potentials. EDWARD O. HOLMES, JR., AND ALDEN HANDY. *J. Am. Chem. Soc.* **50**, 1303–14(1928).—An enlargement on the work of Scarpa shows that in solns. of electrolytes flowing through magnetic fields a potential difference is developed at right angles to the direction of flow and that of the field. The potential difference is independent of the concn. and nature of the dissolved electrolytes, but proportional to the linear velocity and to the field strength. A theoretical discussion of the data from osmotic and dynamo viewpoints is presented, and an equation derived. The possibilities of ionic displacement and induced ionization are discussed.
W. J. SWEENEY

The application of theoretical chemistry to some of the important processes in the production of steel. HERMANN SCHENCK. *Archiv. Eisenhüttenwesen* **1**, 483–97(1928).—A theoretical paper dealing with applications of theoretical chemistry in the production of steel. A discussion is given of the manner in which chem. reactions are influenced

thermodynamically by using for an example the equil: $2CO \rightleftharpoons CO_2 + C$. In considering dephosphorization and Mn combustion in the furnace, the mass-action law is used. Thus is deduced the expression:

$$(P_2O_5) = \frac{(\Sigma P_2O_5)}{1 + \frac{(FeO)^3}{D_1} + \frac{(MnO)^3}{D_2} + \frac{(CaO)^3}{D_3} + \frac{(MgO)^3}{D_4} + \ldots\ldots},$$

(D = equil. const. for the dissocn. of the phosphate and silicate), giving P_2O_5 in terms of (ΣP_2O_5) and the free basic components. In like manner the total MnO content is detd.:

$$(\Sigma MnO) = \frac{[\Sigma Mn](FeO)}{K'} + \frac{[\Sigma Mn](FeO)(SiO_2)}{K'D'_1} + \frac{[\Sigma Mn]^3(FeO)^3(P_2O_5)}{K'^3D_1}.$$

By substituting in this equation the value of (P_2O_5), as given in the previous equation and a similar one for (SiO_2), another expression is obtained which gives the greatest possible concn. of (ΣMnO) that can be present with the MnO in the slag when equil. prevails. If equil. has not been reached, then Mn must be reduced or oxidized, depending on whether the total Mn-content of the slag is greater or smaller than the right side of the equation By other expressions it is shown that the Mn content of the steel or slag is not definitely known at any time, if the Mn is reduced or oxidized. The evaluation of the equations for dephosphorization and Mn combustion is difficult, because the values of the consts. and their variation with temp. have not yet been detd. The chem. processes taking place in deoxidation are also discussed. J. Balozian

Observations of the height of ozone in the upper atmosphere. F. W. P. Götz and G. M. B. Dobson Lichtklimatisches Observatorium, Arosa. *Proc Roy Soc* (London) **A120**, 251–9(1928); cf. Dobson, Harrison and Lawrence (*C. A.* **21**, 2097).—The *ozone* was determined spectrographically. To find the equiv. vertical distance the first thickness is divided by the secant of the sun's zenith distance. Correction must be made when the sun is low, due to curvature of earth's surface. In practice 5 curves drawn showing calcns. of ozone on assumptions of various thicknesses, 0, 30, 40, 50, 60 km. The one most const. was taken as correct for the day. The effect of refraction is negligible for this work. The evidence showed an increase in the height of ozone between autumn and spring and that an increase in the amt. of ozone assocd. with cyclones must occur in the upper part of ozone layer rather than the lower. The av. height is 30–40 km. above sea level Arthur Fleischer

Colorimetry. H. Eckstein. *Chem.-Ztg.* **52**, 317(1928).—The suggestion is made that the changes in color of many of the comparison solns. used in colorimetric detns. might be avoided either by the use of suitably colored stable dyes or of colored glasses as comparison standards when such materials can be obtained. B. C. A.

Calculation of the rotatory power of quartz. R. de Mallemann. *Compt. rend.* **186**, 1046–8(1928); cf. *C. A.* **21**, 2419.—The exptl. results of Ze (*J. phys. radium* 9, 13–37(1928)) are used to deduce the value of the mol. anisotropy which figures in the author's expression for the rotatory power (*C. A.* **21**, 2419). A value of 30°/mm was obtained for quartz at $\lambda 0.546\mu$ (observed value 25.5°/mm.). The agreement is considered satisfactory in view of the indirect method employed and the low exptl accuracy. It is improved if allowance is made for the slight inclination of the plane of principal mol. axes with respect to the ternary crystal axis, the existence of which is indicated by the work of Ze and of Bragg. B. C. A

Ultra-violet refractometry. L. C. Martin. *Trans. Optical Soc.* (*England*) 29, 1–21(1927–28).—A critical-angle method is described for detg. the *n*s of small quantities of liquid for ultra-violet light. Two quartz hemispheres, between which is a thin film of the liquid, are rotated in a beam of approx. parallel radiation, and the critical angles for various wave lengths are measured by means of a quartz spectrograph. A detailed procedure is described and discussed. B. C. A.

Remark on the communication of G. Landsberg and L. Mandelstam on a new effect in the light dispersion by crystals. H. Kornfeld. Vereinigte Stahlwerke, Dortmund. *Naturwissenschaften* **16**, 653(1928).—The 9.1μ value for the proper vibration of $CaCO_3$ found by L. and M. (*C. A.* **22**, 3837) corresponds to an optically inactive proper vibration of the CO_3 ion (*C. A.* **18**, 3313) found by the author (about 8μ) and confirmed by Schäfer, Bormuth and Matossi (*C. A.* **21**, 360). B. J. C. van der Hoeven

The absorption of the visible and ultra-violet light and the interference of x-rays in tourmaline. Paul Stamm. *Neues Jahrb. Min. Abt. A, Beil.-Bd.* **54**, 293–319 (1926). J. F. Schairer

Reflection in complex systems. G. I. Pokrovskii. *Z. Physik* **47**, 898–903 (1928).—In many cases analyses of substances according to the degree of reflection can be of much practical importance, *e. g.*, in the estn. of iron oxide or carbonaceous substances in the earth and in minerals and in detn. of the compn. of flour or of dyes. Analogous methods may serve in investigations of the surfaces of plants. The connection between compn. of substances and their color, etc., is shown by the method. Quant. analysis of substances by the intensity of reflected light was first carried out by P. Here, the reflection of disperse systems, composed of different kinds of elements, is considered. In the case of pulverulent substances a simple law has been found in good agreement with expt. The connection between compn. of a mixt. and its reflection is established, which is important for the quant. *analysis of pulverulent substances.* The paper is largely mathematical. S. L. B. Etherton

Is the molecule of gaseous hydrogen chloride polar or non-polar? F. I. G. Rawlins. *Z. Physik* **50**, 440–2(1928).—From a consideration of the pure rotation spectrum of HCl, of the constancy of its dielec. const. in a variable magnetic field, and of the lack of variable intensity in the short ultra-red, it is concluded, contrary to Kondratjew's view (*C. A.* **22**, 2874), that gaseous HCl is polar. It is suggested that an exptl. study of the relation of the rotation part C_{rot} of the sp. heat to the equipartition value R at temps. near 12° abs. might answer the question more definitely. R. J. H.

Method for obtaining a stream consisting of a mixture in any desired proportions from two or more receptacles which contain the different liquids. A. Sivolobov. *J. Chem. Ind.* (Russ.) **4**, 543–5; *Chem. Zentr.* **1927**, II, 2210.—The 2 liquids fill the 2 side arms of a U-tube. The height of the liquid columns is so regulated that they flow out in the desired proportions from an orifice at the bottom of 1 side arm. The surface of sepn. of the liquids remains at all times at the level of the orifice. C. C. Davis

Recent advances in science: Meteorology. E. V. Newnham. *Science Progress* **23**, 197–203(1928).—A review of recent work on the O_3 and H_2O content of the atm. Joseph S. Hepburn

Investigation of atmospheric deposits. I. W. Liesegang. *Kl. Mitt. Ver. Wasserversorg. Abwässerbeseitig* **3**, 317–27; *Chem. Zentr.* **1927**, II, 2274.—A detailed critical compilation of all the accessible literature which has appeared up to the present time of the chem. nature of atm. ppts. The values ascertained by previous investigators are contained in numerous tables, together with those of L. C. C. Davis

The Pauli exclusion principle. P. Jordan and E. Wigner. *Z. Physik* **47**, 631–51 (1928).—If a body of gas is considered to be a 3-dimensional wave field with non-commutative multiplication of amplitude, and if the Pauli principle of restricted equivalence is applied, it is possible to develop the theory of the gas without use of the concept of abstract phase space, using only the ordinary three dimensional coördinates. F. R. B.

The distillation of water-soluble organic substances with steam. Artturi I. Virtanen and L. Pulkki. *Ann. acad. sci. Fennicae* **29A**, 28 pp.(1927).—If care is taken in the design of the distn. app. to see that all vapor volatilized passes over into the condenser and collecting flask, the following equation represents the change in compn of the liquid on distn.: $(\log y_1 - \log y_2)/(\log x_1 - \log x_2) = k$, where x and y refer, resp., to the quantities of water and of volatile org. compd. and subscripts 1 and 2 refer, resp., to the quantities at the beginning and end of the distn. By this equation, the purity of a soln. of org. compd. such as a fatty acid can be proved by the constancy of k in successive distn. fractions. The influence of initial concn. and time of distn. on the value of k for dil. solns. of formic, acetic, propionic and butyric acids was studied. Concn affects k only to a slight extent but the time of distn. influences k significantly so that it must be kept within close limits in quant. work. The rate of distn. adopted was 100 cc. of an original vol. of 200 cc. in 60 min. A mixt. of 2 volatile compds., *e. g.*, 2 fatty acids, can be analyzed by detg. the total acidity of the initial soln. and of the distillate when half of the soln. has passed over, provided that k for each of the acids is known. A mixt. of 3 acids can be analyzed by detg. the total acidity of initial soln. and distillates when $^1/_4$ and $^1/_2$ of the sample has passed over. When more than 3 acids are present the exptl. errors become too large. If a compd. has a value for k greater than 5 the exptl. errors are too large. Values for k are given for the following acids: formic 0.398, acetic 0.657, propionic 1.270, butyric 2.02, diethylacetic 4.57, chloroacetic 0.047, phenylacetic 0.070, pyruvic 0.074, α-crotonic 0.760, benzoic 0.270, salicylic 0.688, *o*-toluic 0.508, *m*-toluic 0.420, *p*-toluic 0.378, anisic 0.050, cinnamic 0.102, *o*-aminobenzoic 0.019; *m*- and *p*-aminobenzoic and the 3 nitrobenzoic acids do not distil. Approx. values of k for amines are: ammonia 13, methylamine 11, ethylamine

20, propylamine 30, butylamine 40, diethylamine 43, ethylenediamine 0.02, aniline 5.51, methylaniline 16, benzylamine 3.25, α-naphthylamine 1.05, β-naphthylamine very large. For phenols k is: phenol 1.94, *p*-chlorophenol 1.30, *p*-nitrophenol 0.005, *m*-nitrophenol 1.01, thymol 12; for aldehydes: formic 2.6, acetic 40, benzoic 18, anisic 3.1; for alcs.: methyl 8.9, ethyl 12.9. The volatility of a compd. with steam increases as the hydration in soln. decreases. Neutral salts influence the volatility by altering the hydration, usually decreasing hydration and increasing k. Anions have a greater influence than cations. A given salt has a greater influence on less sol. than on more readily sol. volatile compds. There is a striking parallel between the action of salts on the volatility and on the adsorption of compds. from soln. by charcoal.

F. L. BROWNE

Color purity and its measurement (DESBLEDS) 25. Action of concentrated HNO_3 on cellulose (ANDRESS) 23. Studies in metallic nitrides and hydrides (ZHUKOV) 6. The atomic volume relations in certain isomorphous series (HALLIMOND) 8. New apparatus for determining gas densities by Bunsen's flow principle (KAHLE) 1. Dehumidification of air (KEEVIL, LEWIS) 13. Residual thermoelectricity of a Hg filament (TSUTSUI) 4. Protected Ag hydrosols. VI. Formation of sols by irradiation (VOIGT) 3. The fine structure and physical behavior of brookite, and the change of state of the three natural forms of titania (SCHRÖDER) 8.

BOGUE, ROBERT HERMAN: **Traité de chimie colloïdale. Tome I. Chimie colloïdale théorique.** Translated from the 1st Am. ed. by Jean Barbaudy. Paris: Hermann & Cie. 438 pp. F. 80.

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LITTLE, ARTHUR D.: **The Handwriting on the Wall—A Chemist's Interpretation.** An Atlantic Monthly Press Publication. Boston: Little, Brown & Co. 273 pp.

3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

S. C. LIND

Recent theories of the atom. W. F. G. SWANN. *J. Optical Soc. Am.* **17**, 163–97 (1928).—S. reviews recent at. structure theories, emphasizing the essential features and significance of Born's matrix treatment of the problem and Schrödinger's theory of wave mechanics.

R. L HERSHEY

Notation in atomic structure. ARTHUR E. RUARK AND HAROLD C. UREY. Mellon Inst. *Science* **68**, 298–9(1928).—A plea for the standardization of mathematical and physical notation.

H. F. JOHNSTONE

Non-equilateral triangular systems of Rutherford-Bohr. U. CRUDELI. *Nuovo cimento* **4**, 85–95(1927).—Largely math. The non-equilateral triangular systems of Rutherford-Bohr are of importance with respect to models of the He atom. Designating the magnitude of the masses relative to the two vertices bearing equal charges as m and the charge on the other vertex as M (the nucleus) and eliminating the Coulombian hypothesis, one has a neutral, non-equilateral, uniformly rotating Rutherford-Bohr triangular system. Two vertices bear equal charges and masses which do not hold, however, for values of the ratio m/M of less than unity. A general treatment of the Rutherford-Bohr triangular systems is also given for equal charges and masses on 2 vertices, where the sides uniting the third vertex with the other two are unequal.

L. T. FAIRHALL

The correspondence relation between the matrices and the Fournier-coefficients in the hydrogen problem. CARL ECKART. *Z. Physik* **48**, 295–301(1928).—The passing over of the matrix elements of a quantum problem to the Fournier coeffs. of the classical motion for infinitely great quantum nos. and vanishing h is investigated in the specific case of the radius vector in the H atom. The matrix is expressed by means of a formula of Epstein as a hypergeometric function, whose limit for $h \longrightarrow 0$ and quantum nos. $\longrightarrow \infty$ is found to pass over into the Fournier expansion for the radius vector undergoing the Kepler motion. A proof is thus furnished of the truth of correspondence principle for this particular problem.

W. WEST

The energy level of the hydrogen atom according to Dirac's quantum theory of electrons. W. GORDON. *Z. Physik* **48**, 11–4(1928).—The mathematical derivation of Sommerfeld's formula for the fine structure lines: $\frac{E}{mc^2} = \left(\frac{\alpha^2}{1 + (n' + \sqrt{j'^2 - \alpha^2})^2}\right)^{-1/2}$.
S. L. B. ETHERTON

The current of the Dirac electron theory. W. GORDON. Physikalisches Staatsinstitut, Hamburg. *Z. Physik* **50**, 630–2(1928).—Mathematical. The current is resolved into conduction and polarization components.
A. P. SACHS

An interpretation of Dirac's theory of the electron. G. BREIT. *Proc. Nat. Acad. Sci.* **14**, 553–9(1928).—Dirac's theory achieves a fuller significance when combined with Pauli's ideas of the spinning electron (*C. A.* **21**, 3309).
H. R M.

Modern quantum theories. II. LEON CAMMEN. *Mech. Eng.* **50**, 775–7(1928).—Review.
G. L. CLARK

Statistical interpretation of quantum mechanics. A. E. RUARK. *Proc. Nat. Acad. Sci.* **14**, 328–30(1928).—An expt. is suggested to decide between the views of Born and of Darwin on the meaning to be attached to the probability functions occurring in wave mechanics.
B. C. A.

The quantum-theory explanation of the anomalies in the 6th and 7th periods of the periodic table. Y. SUGIURA AND H. C. UREY. Bohr's Institute and Johns Hopkins Univ. *Kgl. Danske Videnskab. Selskab, Math.-fys. Medd.* **7**, No. 13, 3–18(1926).—The older atomic model of Fues and Hartree, which pictures electrons traveling in quantized orbits in a central field of force of unknown intensity, is improved by taking into account the electron spin and the relativity correction. The first of these corrections is of particular importance as it allows treatment of the relativity doublets. It is possible to use this picture to calc. the effective strength of the field from exptly. detd. screening consts. The energy of the 4_4 states of Cs, La and Nd are, resp., —1.71, 0.25 and +0.70 ν/R. These energies become positive first at Ce, which is experimentally the element in which this level first appears. Similarly the 5_4 level should first appear at element 95.
F. R B.

Quantum theory and chemical bond. F. LONDON. *Physik. Z.* **29**, 558–61(1928).—L. reviews the Heisenberg-Schrödinger theory in respect to the bonding of homopolar compds. According to the Pauli principle an atom consists of a no. of equiv. electrons bound in pairs, and a no. of non-equiv. electrons. In the new quantum theory, when 2 such atoms are brought together the non-equiv. electrons are bound and the 2 atoms form a mol. Such electrons as do not belong to equiv. pairs are valence electrons and their no. gives the valence of the atom. The valences thus detd. for the elements agree with those detd. from chem. considerations.
R. L. HERSHEY

The shared-electron chemical linking. L. PAULING. *Proc. Nat. Acad. Sci.* **14**, 359–62(1928).—London's theory of the formation of valency linkings is equiv. in simple cases to G. N. Lewis' theory of the shared electron pair. A number of new results have been obtained in extending London's simple theory, taking into account quant. spectral and thermochem. data. A sensitive test to det. whether a compd. is polar or non-polar is put forward and it is concluded that HF is polar, while HCl, HBr and HI are probably non-polar. If quantization can be changed, as it can in the case of some elements in the first row of the periodic system where the interchange energy resulting from the formation of shared-electron linkings is large enough to bring it about, very stable shared-electron linkings are possible. This explains the stable shared-electron linkings of satd. C compds., and the relatively stable double linkings of carbon. The tetrahedral arrangement of the four linkings of quadrivalent carbon can be shown to be the stable one as a result of the resonance phenomenon.
B. C. A.

Wave mechanics of rotating electrons. I. FRENKEL. Lenigrad. *Z. Physik* **47**, 786–803(1928).—In connection with previous work on the classical, *i. e.*, corpuscular mechanics F. now deduces the corresponding wave mechanics equations of rotating electrons in a relativity invariant form. The equations obtained are analogous to Darwin's equations but have the merit of being invariant.
S. L. B. ETHERTON

Are electrons waves? C. J. DAVISSON. Bell Telephone Lab. *J. Franklin Inst.* **205**, 597–623(1928).—A review of D.'s expts. The question put by the title is answered by asking "Are x-rays waves?" The expts. and their interpretation are discussed in a simple and most readable manner.
W. T. RICHARDS

Waves of an electron. G. P. THOMSON. *Engineering* **126**, 79–80(1928); *Proc. Roy. Inst. Gt. Brit.* **1928**, 9 pp. (reprint).—The evidence for a wave theory of light is interference and diffraction. But light can also impart motion to an electron, depending upon the kind of light and not upon its intensity. This is almost impossible

if light consists of continuous waves but may be expected if light is composed of discrete particles. De Broglie considered light to be corpuscular but accompanied by waves, thus combining the 2 views. In an elec. or magnetic field the electron does not obey the laws of electricity but goes where its wave takes it, *i. e.*, the electron is refracted and can be focused. Expts. are described to test this view and 3 checks for De Broglie's theory support it. The next questions to be solved are (*a*) what are the waves and (*b*) what is the relation between electron waves, waves of light and of x-rays. Theoretically, an exact knowledge of the speed of an electron implies an infinite wave train, but there cannot be an infinite wave train so that speed of the electron can never be exactly known Reasons are given for stating that an electron has no definity velocity. Electron waves and light waves differ, the first are deflected by elec. and magnetic fields; speeds and penetrating powers differ. The waves of an electron may be considered to be waves in an ether modified by tubes of force. Or the waves may be regarded as an expression of the laws of motion, the uniform motion of Newton's first law being replaced by a plane wave and the electron remaining the reality. S L. B ETHERTON

The wave mechanics theory of metallic conduction. I. FRENKEL. *Z. Physik* **47**, 819–34(1928).—The paper is largely mathematical. F gives a derivation of the formula of Pauli and of Fermi for the partition of velocities of electrons at zero abs. He then compares the result with his previous estn. of the energy at zero abs. and interprets values by the wave mechanics theory of the superposition of resonance waves with amplitude 1. A consideration of these "cathode waves" as a consequence of alterations in density due to the heat motion of the metallic atoms leads to an expression for the elec. cond. of metals. S. L B. ETHERTON

Kinetic method in the new statistics and its application in the electron theory of conductivity. L. W. NORDHEIM. *Proc. Roy Soc.* (London) **A119**, 689–98(1928).—The dynamical theory of gases has been worked out in the new statistics, both for the Einstein-Bose and the Fermi-Dirac statistics, and applied to the special case of the electronic cond. of metals. Sommerfeld's mathematical procedure has been justified A J KING

Reflection of electrons by a crystal of nickel. C. J. DAVISSON AND L. H. GERMER *Proc. Nat Acad. Sci* **14**, 317–22(1928) —In continuation of previous work (*C. A* **21**, 1927), an electron beam was directed against a {111} face of a nickel crystal at various angles of incidence, and the intensity of scattering in the incidence plane measured as a function of bombarding potential and direction Whenever the speed of the incident electrons is comprised within any of certain ranges, changing in location as the angle of incidence is varied, a sharply defined beam of scattered electrons issues from the crystal in the direction of regular reflection In each of these ranges there is an optimum speed where the intensity of the reflected beam is a max. The phenomenon is the analog of the regular selective reflection of x-rays, but the Bragg formula does not hold, although there is a simple correlation between the observed positions of the max. and the positions calcd by the Bragg formula B. C. A

Reflection of atoms by a crystal. A. ELLETT AND H. F. OLSON. *Phys. Rev.* (ii) **31**, 643–7(1928).—For Ca and Hg atoms striking a rock-salt surface the incident and reflected beams are equally inclined to the normal. Na is not reflected. H gives irregular results. B C A.

Anomalous effective cross-section of similar atoms when suffering collisions of the second kind. WILHELM SCHÜTZ. *Z. Physik* **48**, 67–72(1928).—Polemical against Orthmann and Pringsheim (*C. A* **22**, 1541) and von Keussler (*C. A.* **21**, 2102). B. C A

Electron diffraction by optical gratings. E. RUPP. A. E. G., Berlin. *Naturwissenschaften* **16**, 656(1928).—On a grating carved in metal electron diffraction could be observed by using glancing reflection of repeated rapid electron bombardment. Pictures are given of the results with 150- and 70-v. rays with diffraction tracks of zero, first and second order. The deBroglie wave lengths estd. are within 5% of the theoretical (1.0 and 1.50 A U.). B. J. C. VAN DER HOEVEN

Inference from the atomic constitution of light energy. J. STARK. *Ann. Physik* **86**, 1037–40(1928); cf. *C A.* **21**, 2839.—An application and extension of previously developed theories to the Doppler effect W. W. STIFLER

Optical anisotropy of atoms and molecules. I. RAMAKRISHNA RAO. *Indian J. Physics* **2**, 435–65(1928).—Lord Rayleigh and Born have both suggested that the fact that light scattered by gases and vapors is not perfectly polarized may be due to optical anisotropy of the mols., although neither explains how this anisotropy arises. Raman has suggested that it may be due to the mutual influence of the atoms constituting the

mol. R. develops a theory of mol. anisotropy assuming optically isotropic atoms. The distances between the optical centers of atoms in mols. are then computed from scattering data. The results thus obtained differ widely from the values given by x-ray data, which are shown to be the more reliable. It is therefore concluded that the assumption of optical isotropy of atoms and ions is untenable. Further evidence for the anistropy of atoms and ions is then given, based on the scattering of light by Kr, X, He and A. Evidence is also adduced from the behavior of CCl_4, CH_4, HCl, NH_3, and H_2O. A method for computing the anisotropy of atoms and ions is developed based on the following assumptions: (1) The polarization induced in an atom when light is incident upon it is different along its 3 principal axes. (2) Distances between the optical centers of atoms in mols. are given by the x-ray data for the corresponding interatomic distances. (3) The refractivities of H^+, C^{4+}, O^{6+} are negligible in comparison with the refractivities of the other atoms or ions of the rare-gas type. (4) All atoms have one axis of symmetry, the refractivities along the other 2 axes being equal but different from that along this axis. (5) The interatomic distances in a mol. in the solid and gaseous states are the same. The computed results are given for a no. of ions for which scattering data are accurately known. These show many regularities. The atoms of the rare gases are less anisotropic than the corresponding ions, and heavier atoms show less optical asymmetry than lighter ones. The asymmetry increases with increasing opposite charge on the adjacent ion. The theoretical basis for at. anisotropy is discussed and it is suggested that possibly it may be explained on the basis of the spinning electron. W. W. STIFLER

The large area of operation in the reciprocal action of similar kinds of atoms. WILHELM SCHÜTZ *Z. Physik* **48**, 67–72(1928).—Consideration of the development of the problem of the anomalously large area of operation in substances of the second kind between similar kinds of atoms. Methods for the detn. of this area of Hg vapor in a magnetic field are compared with regard to the new experience relating to the structure and Zeeman effect of resonance line 2537. S. L. B. ETHERTON

The constitution of zinc. F. W. ASTON. *Nature* **122**, 345(1928).—Using zinc methyl, mass spectra indicate that Zn consists of the following isotopes: 64, 66, 68, 67, 65, 70 and 69. The order in the list shows the order of the intensities. F. E B.

Cinematographic sketch of electrically exploded wires. HANTARO NAGAOKA AND TETSUGORO FUTAGAMI Inst Phys Chem. Research, Tokyo. *Proc. Imp. Acad.* (*Japan*) **4**, 198–9(1928).—Instead of photographic exploding wires on films rotating in a plane at right angles to the line of sight, as has been done previously, photographs were taken on a film moving around an axis parallel to the wire. Photographs are given of the explosion of Cu and Fe wires, and of Mg ribbon Luminous particles are expelled at right angles to the direction of flow of current, not continuously but in masses C. J. WEST

Electric explosions. HANTARO NAGAOKA AND T. FUTAGAMI. *Sci. Papers Inst. Phys. Chem. Res.* (Tokyo) **8**, 269–88(1928).—Plain photograms and cinematographic records were made of the progress of explosions of Al ribbon, fuse wire, Fe wire, manganin wire, Hg in glass capillary tubes, Cu wire, Mg ribbon, Ag wire, elec. lamp filaments, and threads soaked with KNO_3 and NaCl solns. The app. consisted of an a. c transformer operating at 200 v. and 50 ~ on the primary, and delivering 40 k. v. The secondary current was rectified by a 100 k v Kenetron and charged a large battery of condensers. For the cinematographic study, an inductance was put in the circuit to exam the successive stages of explosion. In order to view the exploding wires from instant to instant, a rotating drum of peripheral speed 100 m./sec. with a frequency of 160 cycles per sec. was used to operate shutters with 100 and 360 holes. This gave shutter speeds of 1/20,000 sec. in one case and 1/70,000 sec. in another. The results are fully illustrated by photographs. In most cases the metal wires gave rise to the ejection of luminous particles normal to the direction of the current. For easily oxidizable metals, oxide clouds were developed. The light-emitting portions are in the middle of the wire, and are undoubtedly multiply ionized atoms A series of explosions was carried out in transformer oil, favoring high c. ds., temp. and pressure. A c. d of 10^6 amp./sq. cm. did not suffice for the transmutation of Ag, Al, Mg, Tl, Pb, Bi, Sn and Cd. The residue collected from a Hg explosion, however, gave 30 Au lines and 12 Tl lines. This does not constitute unequivocal evidence of the *transmutation of Hg* HOWARD R. MOORE

Experiments on the realization of the decomposition of the lead atom. A. SMITS AND W. A. FREDERIKSE. Univ. Amsterdam. *Z. Elektrochem.* **34**, 350–60(1928); cf. *C. A* **21**, 855.—The results of the expts. on the transmutation of Pb nto Hg are described. With a specially constructed quartz-Hg lamp very definite positive results

were obtained. This lamp was broken and it was found quite difficult to reproduce all its properties. After many troubles another lamp was constructed which also gave a positive result but only after a much longer time. In the expectation that another easier and more reproducible method might be found, expts. were made with the sparking and flaming arcs. The results obtained here were negative. The indications are, with radiation, that by exposure of Pb to x-rays for a long time radioactivity can be developed. At present it can only be said that these indications are weak and nothing more. When radioactivity occurs and α-particles are emitted after long-time radiation, it is believed that a Szillard electrometer is more sensitive than the identification of Hg by spectroscopic methods. Using a quartz-Pb lamp a positive result was obtained and this result was reproduced but was not so pronounced as the first. All the materials used, the Pb, Fe, carbon and quartz, were found by analytical chem. methods to be Hg-free, and spectroscopic examn. in a C flaming arc proved Hg absent. It is certain that testing in a quartz-Pb lamp is more sensitive than the carbon flaming arc; however the initial spectrum of the quartz-Pb lamp was also free of Hg lines. The only uncertainty may be that the Fe or C electrodes, although found free from Hg by analytical chem. and spectroscopic methods (flaming arc), may yet contain traces of Hg which after the lamp has been run for a time are taken up by the Pb and so Hg lines are found. In the light of these facts the transmutation of Pb into Hg cannot be considered as proved yet. Further work with radiation is to continue. M. R. FENSKE

The atomic synthesis manifested in connection with atomic disintegration, and the theories of the building up of atoms from hydrogen and helium. WM. D. HARKINS. Univ. of Chicago. *Z. Physik* **50**, 97–122(1928); cf. *C. A.* **17**, 3131, 3449.—Out of a total of 45,000 fog track photographs taken by H. and his coworkers, two cases are found in which an α-particle unites with a N kernel, followed by immediate splitting with loss of a proton. A description is given of the "sieve plate" method of obtaining the special coördinates and angles of intersection of these tracks. The min. energy of the α-particle for obtaining these phenomena seems to be from 2.7 to 3.5 $\times$ 10^6 v. A review follows of the theories of H. on at. structure and the periodic system as confirmed by H.'s more recent work. G. M. EVANS

The generation of heat in potassium salts by the radioactive potassium isotope. JOH. KOENIGSBERGER. Univ. Freiburg *Kali* **22**, 266–7(1928).—Assuming the max. possible heat evolution from the Rb and K radioactive isotopes, it is not sufficient to have a detectable influence on the temp. gradient of the earth or on the temp. in K mines MARIE FARNSWORTH

Separation of isotopes of potassium. G. VON HEVESY AND M. LÖGSTRUP. *Z anorg. allgem. Chem.* **171**, 1–13(1928).—By subjecting K to the process of ideal distn. (cf. *C. A.* **16**, 1180), a residue was obtained having at. wt. 39.109, corresponding with an increase of 4.8% in the proportion of the isotope K^{41}. As the radioactivity increased at the same time by 4.2%, it is concluded that this isotope is probably responsible for the radioactivity of K B C. A.

The actinium problem. G. ELSEN. *Chem. Weekblad* **25**, 517–23(1928).—The theories on formation and decay of Act are reviewed. It is possible that a U isotope of higher at. wt. than U I exists and is the parent of the Act series. At. wt. detn of PrAct is considered most significant for a decision in this matter. B. J. C. v. D. H

Condensation of water vapor on charged atoms of actinium A. MINESABURO AKIYAMA. *Compt. rend.* **187**, 341–2(1928).—Trajectories of α-particles emitted by actinon and Act A have sometimes their origins well sepd., yet close. Two photographic app. at 45° to the axis of the expansion chamber were used. The trajectories were visible under a pressure of 530 mm. Hg. Fifty-seven out of 74 had their origin at the same place. Certain atoms of Act A coming from actinon did not increase in wt. to immobility although produced in an atm. satd. with H_2O. They are attracted to an applied elec. field. L. D. R.

Radium, uranium and vanadium. ANON. *Mineral Ind.* **36**, 522–4(1927).—A statistical review. A. B.

The radium and thorium contents of volcanic rocks from Hegau. HEINRICH LEDERER. *Ber. naturforschend. Ges. Freiburg i. Br.* **27**, No. 2, 20 pp.; *Chem. Zentr.* 1927, II, 2273.—The rocks were first decomposed and the quantity of emanation evolved during a given time was detd. by comparison with a Ra-normal soln. According to these expts. the rocks in Hegau can be divided into 3 groups: (1) phonolites with a Ra content of 8.03 – 4.1 $\times$ 10^{-12} g.; (2) basalts with 2.33 – 1.01 $\times$ 10^{-12} g. and tuff with 1.05 – 0.00 $\times$ 10^{-12} g. of Ra per g. of rock. The Th content amounted to 6.18 $\times$ 10^{-6} g. Th for the first group, 0.57 $\times$ 10^{-6} g. Th for the second and 1.01 $\times$ 10^{-6} g. for the last. The measurements of Kaiserstuhl rocks agreed with those of earlier in-

vestigators except for the phonolites. The tephrites are richer in Ra than the basalts of Hegau. C. C. DAVIS

The radium and thorium contents of the phonolite of Kaiserstuhl. WOLFGANG SEITH. *Ber. naturforschend. Ges. Freiburg i. Br.* 27, No. 2, 4 pp.; *Chem. Zentr.* 1927, II, 2273.—Various phonolites and tephrites from Kaiserstuhl were studied and a Ra content of 4.83×10^{-12} and a Th content of 4.25×10^{-5} g. were found. The values for tephrite amount to 6.62×10^{-12} Ra and 4.33×10^{-5} g. Th, without great variations, as supposed by Lederer. From them may be calcd. a U content of 1.55×10^{-5} and 2.10×10^{-5} g. resp. per g. of rock. The Kaiserstuhl also shows a somewhat higher content in radioactive substances than Hegau. C. C. DAVIS

Radioactive haloes in fluorite from Wölsendorf. A. SCHILLING. *Neues Jahrb. Min. Geol. Abt. A, Beil.-Bd.* 53, 241–65(1926).—The numerous types of haloes in the Wolsendorf fluorite are described and photomicrographs given. The sepn. of colloidal metallic Ca is given as a cause of the color. Precision measurements were made on the range of α-particles from U I and U II. J. F. SCHAIRER

Radioactive waters in Poland. SEWERYN GRABIANKA. *Roczniki Chem.* 8, 183–94 (1928).—The spring Cisowy Dworek at Sromowce (near the Tcheko-slovakian border) had the highest radioactivity of the 9 springs examd.: 9.72 Mach units. A Schmidt electroscope was used. MARY JACOBSEN

Dependence of the speed of separation of radium F on the nature and the state of the precipitating metals. G. TAMMANN AND C. WILSON. Göttingen Univ. *Z. anorg. allgem. Chem.* 173, 137–55(1928).—Since a metal in the hard condition is less noble than in the soft condition it may be expected to ppt. nobler metals with greater velocity than the same metal in the soft state. Should the soln. to be pptd. be concd., then the surface of the pptg. metal is soon covered; hence, to study the subject, dil. solns must be used. With metals less noble than Ra F, soft Cu and Ni ppt. rapidly all Ra F atoms meeting its surface, while soft Ag and Fe only ppt. a portion. Let a be the original amt. of Ra F in the soln., x the amt. pptd. in time t, F the surface of the pptg. metal and v the vol. of the soln. in which the amt. a is available, then $dx/dt = (kF/v)(a - x)$; hence on integration $k = (2.3026v/Ft) \log a/(a - x)$. The Ra F pptd. was measured by a gold leaf electroscope. The error in the detn. of Ra F rapidly increases with the radioactivity of the metal used to ppt. it. When the velocity of pptn. is much greater than the velocity of diffusion, the pptn. const. k should have the same value for different metals. But this was not found to be the case. Hence it was assumed that for elements with smaller k, each collision of a Ra F cation did not mean a deposit. From Nernst's theory $k = D/\delta$, where D is the coeff. of diffusion and δ the thickness of the pptd. layer on the pptg. metal, k is calcd. to be 8×10^{-4}. k for hard Ag is 16.3% greater than for soft Ag. Where the metal used is more noble than Ra F, *e. g.*, Au, Hevesy considers that here the Au ion goes into soln. and Ra F ions transfer their charge. T. and W. suggest that the Ra F is adsorbed in the Au and Euler has shown that Ag ions are adsorbed by Au. In the first case, the amt. of the pptd. Ra F will be proportional to the concn. of the Ra F in the soln. In the second case it will be proportional to a power of the concn. as in other adsorption isotherms The latter was found to be the case. Hard Au, Pd and Pt adsorb Ra F twice as rapidly as in the soft state and the same holds for Cu-Au and Ag-Au alloys. Active Cr ppts. Ra F but when passive it absorbs very little. It alloys with ferromagnetic metals, when they do not become passive, ppt. Ra F. S. L. B. ETHERTON

Fractional crystallization of radioactive substances. III. The distribution of radium between solid crystalline $BaCl_2 2H_2O$ and its saturated aqueous solution at t = 0° and t = 35°. VITALIUS KHLOPIN AND ALEXANDER POLESSITSKII. *Z. anorg. allgem. Chem.* 172, 310–20(1928); cf. *C. A.* 22, 1723.—The extremely small quantities of Ra have no practical influence on the 2 phases so that the present case is not analogous with ternary systems of 2 electrolytes which form mixed crystals and water. Henderson and Kracek (*C. A.* 21, 1590–1) in their fractional pptn. of Ba-Ra chromate concluded that the distribution of Ra is analogous to the distribution of a substance between 2 non-miscible solns. The partition factor $D = kc/d$, where c is the amt. in g. of Ba salt per cc. of the satd. soln. and d = sp. gr. of the solid phase. Detns. of D differ with different investigators, though these deviations were probably due to variations in temp. and acid concn. The distribution of Ra between solid $BaCl_2$ and the neutral satd aq. soln. strictly obeys the Bertholet-Nernst distribution law. The distribution ratio, K, remains strictly const. at const. temp. and const. compn. of the liquid phase as well as under large differences in the relative amts. of both solvents. Greatly increasing the concn. of the Ra salt (2×10^3 times) does not affect K. K depends on temp. and the temp. coeff. for this system, between 0° and 35°, is —0.516 per degree,

and from 35° to 57.5° it is —0.275 per degree. Fractional crystn. of Ra chloride and bromide improves with fall in temp. S. L. B. ETHERTON

Velocities of α-particles from radium C, thorium C and C′. G. H. BRIGGS. *Proc. Roy. Soc.* (London) **A118**, 549–57(1928).—The value of $H\rho = MV/E$ for an α-particle from Ra C has been redetd., the app. for producing the magnetic deflection being modified (cf. *C. A.* **21**, 1590). From the value found, 3.993×10^5 e. m. u., and the theoretical value of E/M, 4814.8, calcd. from recent detns. of the at. wt. of He and the value of the faraday, taking into account the relativity correction for the increase in mass of the α-particle, the initial velocity of α-particles from Ra C is found to be 1.923×10^9 cm./sec. The values found by Rutherford and Robinson were $H\rho = 3.983 \times 10^5$ and $V = 1.922 \times 10^9$ (cf. *C. A.* 9, 21). The initial velocities of α-particles from Th C and C′ are found to be 1.705×10^9 and 2.053×10^9 cm./sec. resp. These results are compared with those deduced from the Geiger relation $V^3 = kR$, and found to be in good agreement. A table is given showing the velocities of α-particles from other radioactive substances, the results being deduced from the author's velocity curve for α-particles from radium C (*loc. cit.*) and from Geiger's determination of the ranges (*C. A.* **16**, 3434). B. C. A.

Ultra-violet spectrum of radon. STEFAN WOLF. *Z. Physik* **48**, 790–4(1928).—The spectrum of Ra emanation, hitherto only known in the visible region, is now photographed with a quartz prism app. and about 100 new lines between 3600 and 2400 A. U. have been measured. A new form of *spectral tube* is given with which without the use of quartz a further step forward in the ultra-violet is possible. S. L. B. E.

The radiation of protactinium. OTTO HAHN AND ARISTID V. GROSSE. Kaiser Wilhelm Inst., Berlin. *Z. Physik* **48**, 1–10(1928).—Protactinium, the element of long life with at. no. 91, emits α-particles and changes to actinium, 89. H. and G. now use a very concd. Pa prepn supposed to be free from other radioactive elements and find another weak radiation which they characterize as β. With a completely enclosed cylindrical β electroscope, absorption curves of these rays have been obtained and compared with corresponding β-rays from radioactinium The time change in the curves was another proof that the β-radiation was not due to any other impurity. The intensity of the β-rays of Pa compared with the α-rays was compared with similar results with other Act products. Along with the β-rays, γ-rays were found also. The thickness for half value of Pa rays is 0.055 mm. and the absorption coeff. in Al is 126 cm. The γ-rays of Pa are more penetrating than β-rays of the active ppt. of actinium. S. L. B. ETHERTON

Vaporization of polonium in vacuum. P. BONÉT-MAURY. *Compt. rend.* **187**, 115–7(1928); cf. *C. A.* **21**, 3011, 3544.—App. previously described was used. The form and position of the cold wall and source have been modified. L. D. R.

Radioactive precipitates on high antennae. F. SCHINDELHAUER. *Physik Z.* **29**, 479–87(1928).—An earthed conductor of capacity C in the earth's elec. field becomes charged with a quantity of electricity Q such that $Q/C + V = 0$, where V is the potential of the region in which the conductor is situated. A current flows through the conductor to earth if the elec. field changes, or if the surface charge on the conductor is lost owing to the presence of ions in the surrounding air. The currents produced in the high antennae at Potsdam Observatory by the second cause were investigated; during the period of observation they had a mean value of 3×10^{-15} amp./sq. cm., a value some ten times greater than those previously reported. It is concluded that the currents are produced principally by deposition of radioactive material on the conductor for the following reasons: (1) Changes in conditions, such as atm. pressure and ground temp., which det the escape of radioactive gases from the ground, produce concomitant changes in the current. (2) The current varies with wind pressure, and the vertical temp. coeff. of the air in the same way as the radioactive content of the air, and diurnal variations in the current are similarly connected with the diurnal variations of the concn. of radioactive gas in the lower atm. W. WEST

Radon pump. L. F. CURTIS. *J. Optical Soc. Am.* **17**, 77–80(1928).—Rubber tubing and stopcocks through which Hg must pass are eliminated. The pump is designed to remove Rn from a soln. of Ra salts. Two Toepler pumps in series are used The Rn is purified in the usual way by sparking, passing through P_2O_5, KOH, CuO bulbs, and freezing down with liquid air and pumping off uncondensed gases. L. D. R.

Ionization curve in pure hydrogen relative to the α-rays of polonium. FREDERIC JOLIOT AND TADASHI ONODA. *J. phys. radium* **9**, 175–9(1928).—17.30 ± 0.03 cm. is the path in H_2. The stopping power is deduced to be in ratio to air 0.223. The range in air is 3.87 ± 0.01 cm. at 15° and 760 mm. Hg. L. D. R.

Number of ions produced by α-rays of radium C′ in air. IRENE CURIE AND FREDERIC JOLIOT. *Compt. rend.* **187,** 43–5(1928); cf. *C. A.* **22,** 3827.—Using satn. currents i_α corresponding to the absorption of α-rays in the Mme. P. Curie app. and current i_γ produced by an ionization chamber receiving γ-rays emitted by the source (Ra B + Ra C), filtered by 15 mm. Pb, currents i_α and i_γ are alternately measured. The chamber for penetrating rays has been carefully standardized. Using 4.774×10^{-10} E. S. U. as elementary charge and 3.7×10^{10} or 3.45×10^{10} as the no. of α-particles emitted by 1 g. of Ra, the no. of ion pairs produced by an α-particle from Ra C′ is found to be 2.2×10^5 or 2.36×10^5. It is concluded that the real form of the Bragg curve relative to the α-rays from Ra C′ should be intermediate between that of Henderson and that of Irene Curie and F. Behounek. L. D. R.

The phenomenon of groupings of atoms for emanation and for mixtures of radioactive elements. C. CHAMIE. *Compt. rend.* **186,** 1838–40(1928).—Cf. *C. A.* **22,** 725. Three methods of making photographs have been used: with Rn included in Hg; directly with Rn from mixts. of radioactive elements; emanations from radioactive elements form groups which give starlike photographs, the rays corresponding to paths of particles from the different elements used. Mixts. give rather heterogeneous groupings but there are similar groupings of the same family. L. D. R.

Spectroscopy of γ-rays by crystalline diffraction. MARCEL FRILLY. *Compt. rend.* **186,** 1614–5(1928); cf. *C. A* **22,** 2876.—In the region of 20 U X four other lines are obtained – 16, 24, 26 and 29.5 U X. 24 and 26 U X are difficult to sep. The results of these expts are in agreement with those of photo-elec. spectra within the limits of the precision of measurements. In 15 hrs. with 500 millicuries a weak impression of lines 16.2 and 35 U X is obtained. The other 3 lines are obtained with an exposure of 3 days. L. D. R.

New diffused radiations. Y. ROCARD. *Compt. rend.* **186,** 1107–9(1928).—The radiations described by C. V. Raman (*Indian J. Physics* **2,** Part III, 1 (1928)) are discussed. These radiations differ in wave length from the incident radiation. They seem to be optical beats due to various frequencies of oscillation of the elec. moment of mols. L. D. R.

The Raman effect. PETER PRINGSHEIM. *Naturwissenschaften* **16,** 597–606 (1928).—The Raman radiation effect (*C. A.* **22,** 1079, 1907) consisting of frequency changes in visible light scattered by a liquid with wave lengths varying with and related to the incident light (differing from fluorescence) is discussed at length. The phenomenon is related to the Tyndall effect: the intensity of the scattered light increases close to the crit. condition of the liquid. The explanation of the Raman effect as an analogon of the Compton effect for x-rays is accepted. The energy yielded by the quanta of the incident rays to liquid mols. serves for nuclear vibrations (not for kinetic propulsion); the scattered ray is of correspondingly lower frequency. Evidence for this theory is contained in the independence of the shift on the condition (solid or liquid) of the scattering body and in the appearance of equal shifts, attributed to excitation of certain molecule groups (C-H, C-C) in various org. liquids (cf. Rocard, preceding abstract, Cabannes and Daure, *C. A.* **22,** 3096; Raman and Krishnam, *Indian J. Phys.* **2,** 399(1928)). The nuclear vibrations here assumed are identical with those found from ultra-red research. The corresponding anti-Stokes lines (of equally higher frequency) have also been found in the Raman effect. Difficulties are experienced in the explanation of the latter on the basis of Schrödinger's wave mechanics.
B. J. C. VAN DER HOEVEN

The theory of the Raman effect. M. BORN. *Naturwissenschaften* **16,** 673(1928).—Several of the peculiarities of the Raman effect (relative line intensities specially) are in complete accord with the statistical interpretation of quantum mechanics even if Schrödinger's equation does not offer an explanation. B. J. C. VAN DER HOEVEN

Penetrating radiation. J. CLAY. *Proc. Acad. Sci. Amsterdam* **30,** 1115–27(1927).—Measurements of the penetrating or ultra-γ-radiation have been made at Bandoeng, Java, from February to July. There appears to be a daily variation in intensity with a min. at about 8 A. M., which is always maintained, although the av. value for the day may vary with the season. Absorption expts. indicate that there are at least 2 different kinds of rays, with possible mass absorption coeffs. of 17×10^{-3} cm.$^{-1}$ and 4×10^{-3} cm.$^{-1}$, which are greater than those found by Millikan and Cameron (*C. A.* **21,** 700). The wave lengths calcd. from these are 3×10^{-11} and 0.8×10^{-11} cm., resp. The intensity of the radiation appears to decrease with increasing altitude at first and then to increase. A penetrating radiation was also observed in a rock-salt mine in Stassfurt. B. C. A.

Astrophysical aspects of the general field of penetrating radiation. B. P. GERASI-

MOVIČ. *Proc. Am. Acad. Arts Sci.* **62,** 173–85(1928).—The flux of penetrating energy outside our atm. is calcd. from the results of Millikan and Cameron, to be 10^{-6} ergs per second per sq. cm. The energy of the free electrons produced in a rarefied gaseous layer in this radiation field is high, but the percentage of atoms ionized is, for Eddington's interstellar gas (H), only of the order of 10^{-8}. The local fields within nebulas, unless they are absurdly strong, cannot give effects of the order of those produced by stimulating stellar radiation. W. T. RICHARDS

Rendering h rays visible. HANS PETTERSSON. *Z. Physik* **48,** 795–8(1928).—Two simple methods are described: (*a*) Wilson's method, (*b*) scintillation method, to render visible natural *h* rays from α irradiated paraffin. S. L. B. ETHERTON

Dependence of the photographic action of β-rays on their velocity. C. D. ELLIS AND G. H. ASTON. Trinity College, Cambridge. *Proc. Roy. Soc.* (London) **A119,** 645–50(1928).—Electrons with energies above 200,000 v. were used (β-particles from Ra, B and C). Relative photographic activities were plotted against velocity. Comparison of the exptl. curve with the theoretical one for the ionization shows that the exptl. activity changes at first less rapidly and finally more rapidly than the theoretical. GREGG M. EVANS

Experiments on the diffraction of cathode rays. II. G. P. THOMSON. Corpus Christi College, Cambridge. *Proc. Roy. Soc.* (London) **A119,** 651–62(1928); cf. *C. A.* **22,** 1723.—The deBroglie wave theory was found to agree with expt. in diffraction patterns from electrons passing through thin Pt, and in calcn. of grating consts. for Al, Au and Pt. The velocity of the diffracted electrons differs by less than 1% from that of the main beam. Electrons must be accompanied by a train of not less than 50 waves. GREGG M. EVANS

Diffraction of cathode rays by thin celluloid films. ALEXANDER REID. Univ. of Aberdeen. *Proc. Roy. Soc.* (London) **A119,** 663–7(1928).—The deBroglie wave theory has been tested by obtaining diffraction patterns of the Hull-Debye-Scherrer type from electrons passing through thin celluloid films. Voltage measurements by electrostatic deflection agreed within 1% with spark gap measurements by Thomson (cf. preceding abstr.) The spacing of the planes giving the deflection is calcd. as 4.46 A. U. G. M. EVANS

Diffraction of cathode rays by thin films of copper, silver and tin. R. IRONSIDE. Aberdeen Univ. *Proc. Roy. Soc.* (London) **A119,** 668–73(1928); cf. preceding abstr.—A corroboration of previous work. Agreement with x-ray data is within 1%. G. M. EVANS

The scattering of cathode rays. B. F. J. SCHONLAND. Univ. of Cape Town. *Proc. Roy. Soc.* (London **A119,** 673–80(1928); cf. *C. A.* **20,** 541.—Previous expts. have been found inadequate for a test of relativity correction for the orbits of deflected β-particles. A mathematical treatment of the correction is given, leading to an estimate of the amount of scattering to be expected. This is in fair agreement with expt G. M. EVANS

Back diffusion and secondary radiation of moderately soft cathode rays on metals. K. H. STEHBERGER. Heidelberg Radiol. Inst. *Ann. Physik* **86,** 825–63(1928). —An app. is described in which the distribution of velocities of the secondary electrons from an x-ray target can be quantitatively studied. The true secondary rays have velocities of 0 to 36 v. independent of type of target and of velocity of exciting electrons. The ratio of the true secondary emission to the electrons due to back diffusion shows that the true secondary emission probably comes from electrons diffusing backwards. F. R. B.

Use of the negative charge of cathode rays as writing medium in cathode oscillographs. P. SELÉNYI. *Z. Physik* **47,** 895–7(1928).—Up to the present, phosphorescence and the cathode oscillograph have been used for recording purposes. S. uses another property with which it is simple to work. Cathode rays are directed upon an isolated plate set upon the internal glass wall of the tube. Curves are obtained because of the elec. charges. These are rendered visible by dusting the outer surface with S and red lead. Any electroscopic dust will serve and the Lichtenburg figures will be disclosed. It is expected that this process may afford a writing speed of 30 km./sec. S. L. B. ETHERTON

Connection between positive rays and the abrupt change of potential at the cathode for the thermal emission from an oxide cathode. Method of obtaining the energy of emission. GERHARD SCHMERWITZ. *Z. Physik* **48,** 259–75(1928).—Exptl. details are given for the detn. of the pos.-ray current, the anode current, and the abrupt change of potential at the cathode for a tube with a cathode coated with CaO. The electron stream showed no relationship with the change of potential at the cathode; the pos.-

ray current showed a linear relationship with it for high values, but at about 2.4 volts there was an abrupt change in the curve. Below this voltage there was practically no pos.-ray current. In high vacua the same result was obtained, the value being independent of the temp., and thus of the no. of electrons emitted. It is shown that this critical voltage is the equiv. of the energy of emission of the electrons from the CaO. Similar results were obtained with BaO and SrO, and these agree with the values obtained by Spanner. B. C. A.

Energy of radiation excited by electronic bombardment. PIERRE BRICOUT. *J. phys. radium* [vi], **9**, 88–119(1928); cf. *C. A.* **22**, 726.—An app. is described for the detn. of the relation between the energy of the electrons emitted from a hot filament and the intensity of the radiation excited by them, and a method of measuring the abs. value of the energy emitted is developed. A theoretical explanation of the results is discussed, and a calcn. made of the probability of the emission of a quantum of energy due to a collision between an electron and a neutral atom. B. C. A.

Spectral study of the luminescence of water and carbon disulfide under gamma radiation. L. MALLET. *Compt. rend.* **187**, 222–3(1928).—A special spectrograph, designed by Ch. Fabry, was used for these weak radiations. Two glass tubes, each contg. 250 mg. of Ra as $RaSO_4$, were used as the source. Time of exposure was from 2 to 4 days. The visible region and the beginning of the violet were studied. About 3700 was the limit of the instrument. L. D. R.

Optical experiments with electrons. I. L. H. GERMER. Bell Tel. Lab., N. Y. *J. Chem. Education* **5**, 1041–5(1928).—The wave nature of moving electrons is established. Reflection, refraction, and diffraction have been observed. A stream of electrons directed against a Ni crystal is reflected with angle of reflection equal to angle of incidence. Electrons and x-rays are reflected from a crystal but not from a polycrystalline surface. The electron is also selective in speed of bombardment. "Electrons are diffracted by a Ni crystal as if they were waves having a wave-length given by the quotient of Planck's const. and the electron momentum, *mv*." L. D. R.

Tracks and radiation of electrons emitted by hydrogen. T. ENGSET. *Ann. Physik* **84**, 880–90(1928).—Mathematical. B. C. A.

Magnitude of motion of conducting electrons. II. A. E. MALINOVSKII. *Z. Physik* **47**, 859–85; cf. *C. A.* **21**, 2221.—Faraday considered the elec. current as a kinetic process. Modern electrodynamics assumes moving electrons within the conductor. Tolman and his co-workers are considered to have given a direct proof of this. M. uses an elec. current for elucidation of the magnitude of motion and develops mathematical expressions for the phenomena involved. His app. consists of a ring, half of Cu and half of Bi. This is placed in a highly evacuated space and suspended from a thin filament. A thermocurrent is produced by heating the soldered places with an arc lamp. The rotation of the ring was optically measured as usual. The negative result obtained is discussed theoretically. Conclusion: Self-induction does not affect the electromagnetic magnitude of motion of conducting electrons. S. L. B. E.

Superconductivity according to Schrödinger's wave equation and Fermi's statistics. ERICH KRETZSCHMANN. *Ann. Physik* **86**, 914–28(1928).—In a microscopic isotropic homogeneous metallic conductor in which the elementary charges are acted on by coulomb forces, there is, according to the Schrödinger wave equation, no elec. resistance provided the distribution of energy and momentum is in accordance with the Fermi statistics. F. R. B.

Electromechanical phenomena and free electrons in metals. ALBERT PERRIER. *Bull. soc. vaud.* **55**, 309–13(1926); *Physik. Ber.* **7**, 246(1926).—P. considers the mech. effects occurring parallel to the current direction, and the no. of free electrons in metals. The whole discussion is based only on the classical theory of free electrons. P. calcs. the force exerted on the metal ions by a modification of the elec. field, and shows that this effect may be detected by resonance and used to det. *e/m*. He will try to calc. the no. of free electrons per cc. by means of the present considerations and the use of high frequency oscillations. A L. HENNE

Process of obtaining the maximum of ultra-violet rays with short waves. N. IAROTZKY. *Compt. rend.* **187**, 459–71(1928).—A new type of quartz-Hg lamp is described, using 80,000 v. and giving radiations as low as 253$\mu\mu$. Irritant action on the skin is produced by rays of 300 to 230$\mu\mu$ whereas rays of 260 to 230$\mu\mu$ have the greater bactericidal action. The lamp does not give heat radiations; no heat filters are required, and the patient can be treated nearer the source. E. G. VANDEN BOSCHE

Ultra-violet radiation of a few organic phosphorus compounds following their irradiation. C. SERONO AND A. CRUTO. *Rass. clin. terap. sci. affini* **27**, 167–71(1928).—Irradiated ergosterol slightly darkens the photographic plate. This property is in-

herent in the yellow waxy surface layer which could be sepd. from the inactive remainder and which contains P. A mixt. of cholesterol and *lecithin* from egg yolk had a distinct effect on the photographic plate after irradiation. *Lecithin*, pure *cerebrin* and *chlorophyll* have a pronounced photoactivity after irradiation by a Hg lamp through a Wood screen (360–350$\mu\mu$), while cholesterol, oxyhemoglobin and fresh blood are inactive. The irradiated inactive substances show a vivid greenish violet fluorescence while the active substances have none. The phenomenon is apparently an *ultra-violet fluorescence*, the λ of which is in the vicinity of the exciting one. The facts that a photochem. effect is obtained on a distant photographic plate, that the pictures are neatly bordered when a perforated Pb screen is used and that the activity is preserved for 20 days are sufficient evidence against the assumption of an ozonide. The activatable phosphatides have apparently the function of storing ultra-violet radiation in the living organisms, and of activating metabolism. The fact that lecithin is always assocd. with cholesterol suggests that the latter had a retarding and protective effect. Through its permeability to water in which it is insol it protects the cells without impairing the osmotic or metabolic processes. The catalytic effect of injected lecithin on metabolism finds an explanation in the stored radiation. MARY JACOBSEN

The effect of ultra-violet light on the dielectric properties of crystals. ALBERT A. AARDAL. Ia. State Col., Ames. *Proc. Iowa Acad. Sci.* **34,** 276(1927).—Measurements have been made on the dielec properties of some of the natural crystals, and it has been shown that the values of the consts. are changed upon exposure to ultra-violet light. The most important of these properties are dielec. const., phase angle, and resistance, all of which show this variation when exposed to the short wave lengths. W. G. GAESSLER

Theory of absorption and dispersion in x-ray spectra. R. DE L. KRONIG AND H. A. KRAMERS. *Z. Physik* **48,** 174–9(1928).—An explanation is put forward for the fact that the effective no. of oscillators that must be assocd. with continuous absorption bands in the case of x-rays in order to give the observed dispersion and absorption is different from the no. of electrons in the shell assocd. with the particular absorption band concerned. In particular, the case of the K-band is considered, and it is shown why the effective no. of oscillators is less than 2. B. C. A.

Röntgen ray energy measurements with the selenium intensimeter. W. SCHMITZ *Fortschr. Geb. Röntgenstr.* **35,** 684–97; *Physik Ber.* **8,** 629(1927).—For different Röntgen rays homogenized by filtration, whose abs. energy is detd simultaneously colometrically, the action on a Se cell is systematically investigated for the range from 0.2 to 1.5 A. U. A max. of sensitivity was observed at 0.2 A. U. The Fürstenau cell maintained excellent constancy for long periods. G. L. CLARK

Spectrography with a line grating in the region of soft x-rays. Emission and absorption spectra in the intermediate range. JEAN THIBAUD. *Bull. soc. encour. ind. nat.* **1928,** 481–2; cf. *C. A.* **21,** 1593, 3158. G. L. CLARK

Is crystal reflection of x-rays entirely a classical phenomenon? I. WALLER AND R. W. JAMES. *Nature* **122,** 132–3(1928).—A discussion of the formula of Jauncey and Claus (*C. A.* **22,** 3580) concerning scattering of x-rays, and a method of checking this formula G. R. YOHE

Total reflection. A. ROSTAGNI. *Nuovo cimento* **4,** 218–28(1927).—A pencil of rays from a voltaic arc light adjusted to secure approx parallelism of the rays through a 3-mm. aperture was passed through a glass prism into a layer of CS_2 and impinged at an angle of 60° on the sepg. surface from a thin superposed fluorescent layer of a dil basic soln. The radiation of the region of approx. 390$\mu\mu$ predominates with respect to the various media traversed, *i. e.*, Wood's screen, $CuSO_4$ soln., ordinary glass and CS_2. The purity of the CS_2 and of the sepg. surface was assured so that the possibility of diffraction from particles in suspension was avoided. To det. in order of magnitude the amt. of energy passing into a rarer medium, a layer of fluorescent soln. was produced by an app. for demonstrating Newton's rings and exposed to the luminous pencil The intensity of the fluorescence differs in the various regions and increases with the thickness. Calcd. values agree with observed values. L. T. FAIRHALL

Reflection of hydrogen atoms from crystals. THOMAS H. JOHNSON. *J. Franklin Inst.* **206,** 301–15(1928); cf. *C. A.* **21,** 3543.—Full details are given of an app. for studying the reflection of a ribbon-like beam of at. H from the heated surface of a crystal. The reflected atoms are recorded on a plate coated with MoO_3 which is reduced to metallic Mo by the at. H. Calcite, sylvite, rock salt and quartz all give diffuse reflection if the temp. is high enough. The intensity of this diffuse reflection depends in marked degree upon the temp. of the crystal. Sylvite must be at a much higher temp. than rock salt to give the same intensity of diffuse reflection, while calcite and quartz must

be at temps. between these two. It is suggested that this type of reflection may be explained as an adsorption and reëvapn. of the H atoms at the surface. A cleavage surface of rock salt also gave evidence of specular reflection. An attempt to explain this on the old mechanics of forces between atom and crystal shows these ideas to be inadequate and a discussion is given which is based on wave mechanics. The paper is in the nature of a preliminary report. W. W. STIFLER

Molecular collisions of the second order (excitation of Lyman bands and the non-transformation of the symmetric and asymmetric series of the hydrogen molecule). H. BEUTLER. Kaiser Wilhelm Institut physik. Chem. und Elektrochem. *Z. Physik* **50,** 581-99(1928).—Traces of H_2 in 2-3 mm. argon are subjected to strong discharge to det. the mechanism of excitation of Lyman bands. According to wave mechanics one must assume 2 varieties of H_2 mols. which are, resp., sym. and asym. in the nuclear functions and are not mutually transformable. The selective excitation of the Lyman bands in A-H_2 mixts. can be explained on the principle of resonance in collisions of the 2nd order only by assuming this non-transformation. A. P. SACHS

K-electron ionization by direct impact of cathode rays. D. L. WEBSTER. *Proc. Nat. Acad. Sci.* **14,** 339-44(1928).—The assumptions underlying the theory of indirect K-ionization used in previous work (*Ibid* 330) and here, are first tested by finding the ratio of the indirect K α-line rays of Ag to its continuous spectrum rays of the same wave length. This should be independent of all questions of resolving power, sensitivity function, etc The results obtained are of the right order, although not strictly accurate. The probability of direct K-ionization by a cathode ray in Ag is found to be 0.9 times the probability of an equiv. quantum emission in the continuous spectrum; the ratio is practically const. with change of voltage, and therefore must hold, not only for ordinary thick targets, but for infinitely thin targets also. The absolute probability of direct K-ionization is also estd. with large limits of error, and found to agree with the Thomas theory. It seems probable that the process of direct ionization is not usually an internal photoelec. effect, but rather a process of repulsion between electrons obeying laws much like the inverse-square law. B. C. A.

Potential of ionization of a molecule of water. R. GRINFELD. *Univ. Nac. La Plata, Estudio Ciencias,* No. **82,** 283-93(1928); *Science Abstracts* **31A,** 398.—The method here adopted is that of Lenard (collisions with electrons). A crit. potential of 18.0 v. is obtained. In a discussion of the various possible cases it is found that this value should correspond with the energy necessary to detach the electron from the mol. structure. H. G.

Experiments with modified mucronate electrodes. CARL BARUS. Brown Univ. *Proc. Nat. Acad. Sci.* **14,** 188-91(1928).—The production of ionic currents is investigated by measuring with a form of interferometer the pressure of the elec. wind from a metal point placed within a field of 25 kv. cm. maintained between 2 plate electrodes; curves are given showing the relation between the strength of the wind and the "distance of extrusion," y, of the point into the field. For the cathode point, the wind begins at a y value of 0.06 cm indicating that a p. d. of 1.5 kv. is required to produce a steady emission of neg. charges, resulting in a uniform convection current with a wind pressure which may reach 0.4 mm. Hg. For the anode, the p. d. required to bring about the steady emission of ions is similarly found to be 6 kv. W. WEST

Anode and cathode sparks differentiated by the mucronate ,electrode. CARL BARUS. Brown Univ. *Proc. Nat. Acad. Sci.* **14,** 248-51(1928); cf. preceding abstr.—Further descriptions of sparks produced by the electrode arrangement described above. W. WEST

Polarization of ions in crystal lattices. A. E. VAN ARKEL. Philips' Gloeilampenfabrieken, Einhoven, Holland. *Z. Physik* **50,** 648-56(1928).—Ions are assumed equally polarizable in all directions and the energy of polarization (A) in crystals is calcd. In binary compds. A is least in the CsCl lattice type and increases with increasing coördination no. The experimentally detd. increase of A for the NaCl lattice type and still greater increase for zinc-blende type becomes understandable. Among the alkali halides the CsCl lattice type is found only for compds. with low A, but KF with low A shows the NaCl lattice. If the NaCl lattice structure of CsF is explained by polarization, inadmissably small values of A must be assumed. Where r = the radius of the spherically symmetrical polarizable region surrounding the nucleus and a = the uniform distance of polarizing charges surrounding the ionic nucleus, then $\beta = r/a$, and β is probably always < 0.7. For these values of β, A is shown to have the following order of values CsCl < NaCl < zinc blende. A. P. SACHS

Ionization in nebular matter. B. P. GERASIMOVIČ. *Proc. Am. Acad. Arts Sci.* **62,** 155-71(1928).—The ionization of a planetary nebula stimulated by the radiation

of a very hot star has been investigated assuming that (1) the nebular layer is composed of atoms having only one stationary state and (2) that this is steady and "tangent" to the series of dynamical states The electron temp. thus calcd. depends only on the optical thickness of the gaseous layer and the effective temp. of the stimulating star, and is independent of the diln. of radiation. The derived temps. are between 25,000° and 2000° for different optical thicknesses. A complete ionization formula has been deduced which shows the ionization of normal and metastable H and He nebulae to be very high. The nebular absorption coeff. as a function of d. is discussed in the light of Kramer's theory. W. T. RICHARDS

Ionization on thermal decomposition of ozone. R. RUYSSEN. Univ. Brussel. *Natuurw. Tijdschrift* **10,** 101–16(1928).—A stream of ozonized O_2 from a gasometer was passed through an ionization chamber with electrodes heated to 230° to 240° (sufficient for complete decompn.); the current set up was measured and the no. of mols. passing. The O_3 concn. of the gas entering the ionization chamber was detd. by KI titration, the gas vol. measured in a Juliard anemometer (*C. A.* **22,** 1914). The ionization chamber was a Pyrex glass cylinder with cylindrical electrode at the wall and axial rod, 5 mm. apart, 15 cm. long; it was heated in an elec. furnace. Quartz appeared to give insufficient insulation at high temp. The ionization current was measured by quadrant electrometer (Lindeman) the needle being connected to the inner electrode (outer electrode to a storage battery) and to one side of a standard condenser, which was being charged so as to give a zero reading on the electrometer (quadrants at +41 and —52.5 v.) From time, final potential and capacity of the condenser the current was $i = cV/t$ The accuracy was 10^{-16} amp , total capacity 9.4×10^{-11} farad. For pure O_2 the displacement of the needle was negligible; for ozone very considerable for either positive or negative field in the ionization chamber. The data gathered are for fields of ± 845 to 905 v., ozone content 0.8 to 9.9% by vol., *i. e.*, 0.7 to 8×10^{17} mols. decomposed per sec The flow rate was varied. Increasing rate of flow from a min. up does not influence the ionization (at very low rates some O_3 decomposes at entrance). For m/n, the no O_3 mols. decomposed per sec. per electron charges collected, were found values between 0.8 and 1.3×10^{10} (10^{-11} to 10^{-12} amp); *i e.*, the ionization current was proportional to the no. mols. decomposed The m/n value is independent of field direction; therefore as many + as − ions of about equal mobility are liberated. The ionization rises rapidly and linearly with increasing field At the highest field values (3000 v) signs of satn. begin to appear. For the mechanism of the $2O_3 = 3O_2$ reaction it is concluded that two stages exist: (1) ionization into + and − oxygen ions, a time reaction ($2O_3 = 2O_2 + O^{--} + O^{++}$), (2) recombination to neutral oxygen mols., instantaneous (high m/n value and difficulty of satn.) ($O^{--} + O^{++} = O_2$) B. J. C. VAN DER HOEVEN

Effects produced by positive-ion bombardment of solids: metallic ions. M. L. OLIPHANT. Trinity College. *Proc Cambridge Phil. Soc.* **24,** 451–69(1928).—An unsuccessful attempt has been made to show the nature of energy exchange, but several important anomalies have been revealed. The Kunsman source of positive ions has been used. A W filament such as contained in a Coolidge x-ray tube and coated with the mixt. of oxides is used to supply the ions. A focusing hood made a few volts positive in respect to the filament surrounds the filament. A two-stage diffusion pump produced a vacuum of probably 10^{-8} mm. Expts. support the photoelec. theory of the production of electrons by neutralization of positive ions at the cathode. L. D. R

Electrons and positive ions in pure argon. MARIO A. DA SILVA. *Compt. rend* **187,** 32–5(1928).—Previously results were obtained at 758 mm. and continuous voltage It was decided to learn if all the negative ions were electrons. New curves with alternating voltage, sinusoidal of 42 periods, were plotted. All the negative ions are electrons. L. D. R

Anomalous dispersion of excited gases. I. The proof of the quantum theory dispersion formula. RUDOLF LADENBURG. Kaiser Wilhelm Inst., Berlin. *Z. Physik* **48,** 15–25(1928).—Mainly mathematical. The relation between f and A in the D lines of Na is verified exactly. On the basis of the dispersion formula that is developed, L. dets. the transformation probability and density of excited atoms by measurements of anomalous dispersion. Under these conditions the influence of negative dispersion can be demonstrated. **II. Anomalous dispersion in excited neon.** HANS KOPFERMANN AND RUDOLF LADENBURG. *Z. Physik* **48,** 26–50(1928).—The method used for the investigation of the Balmer lines of electrically excited H, *i. e.*, the method of horizontal interference stria, was used in this work. The influence of current and pressure on anomalous dispersion is shown and is theoretically discussed. About 20 $S_5 = P_k^-$, $S_4^- r_k^-$, $S_3^- p_k$, $S_2^- p_k^-$ lines in the red-yellow were used. S. L. B. ETHERTON

Anomalous dispersion in thallium vapor. V. K. PROKOVIEV AND V. N. SOLOVIEV. *Z. Physik* **48**, 276–85(1928).—The anomalous dispersion of Tl vapor was investigated in the neighborhood of the lines 3776 and 5353, at different temps. from 892° to 1107°. It is found that the ratio of the no. of dispersion centers for these lines varies with the temp. according to the Boltzmann law. From this it is shown that the probabilities of the spontaneous transitions $2s \longrightarrow 2p_1$ and $2s \longrightarrow 2p_2$ (Paschen-Götze notation) are equal. B. C. A.

The smallest electrical carriers in gases. HEINRICH SCHILLING. Univ. Heidelberg. *Ann. Physik* **86**, 447–8(1928); cf. *C. A.* **21**, 3155.—A note supporting S.'s conclusions on the mobilities of positive and negative ions, in spite of the criticisms of Loeb (*C. A.* **22**, 910). H. R. MOORE

A new counting method for corpuscular radiation depending on amplification of true electronic current. EDOUARD RAMELET. *Ann. Physik* **86**, No. 14, 871–913 (1928).—The method of Greinacher (*C. A.* 21, 3544) has been improved by use of resistance coupling and adapted to quant. study. Amplifications of 1.6×10^9 have been obtained. α-particles give varying impulse which is due to decrease of the ionization of the gas through which they pass. The shape of the impulse wave was studied with the oscillograph and the impulse shown to be inhomogeneous in all gases except H_2, which could not be studied on account of the rapid recovery. The impulse depends on the mass of the ionized gas, and is exceptionally great in case of mixed gases. Monatomic gases were not studied. F. R. B.

Chamber for the study of ions and electrons in gases. LEONARD B. LOEB AND A. M. CRAVATH *J. Optical Soc. Am.* **16**, 191–6(1928).—A detailed description is given of a metal ionization chamber suitable for use in research on the mobilities and saturation currents of ions and electrons in gases. The app. has been employed successfully with H_2S. B. C. A.

Accurate measurement of the number of ions produced by a single α-particle, and proof of the existence of new activities. HANS ZIEGERT. *Z. Physik* **46**, 668–715 (1928); *Science Abstracts* **31A**, 381–2.—The app. used comprised a Hoffmann-Duant electrometer recording photographically on a revolving drum, a hollow spherical ionization chamber contained in a Cu bell jar over a massive brass plate, and an elec. arrangement by means of which the electrometer deflections due to β-rays and γ-rays could be balanced. Each α-particle produced a deflection, which appeared on the record as a sudden break in the line traced on the photographic film, the length of the line measuring the alteration in charge of the electrometer and so the no. of ions produced. This length varied, since the velocities of the α-particles are different for different radioactive substances, and also because some of the α-particles hit the walls of the chamber before their energy was exhausted. The lengths of these lines were measured on a measuring machine, which is described, and were dealt with statistically in such a way that it became possible to sep. the effects due to different radioactive components in a mixt. Joffé's satn. theory being taken into account, the following values were obtained for k, the no. of ions produced by each α-particle in air at 0° and 760 mm.: U I, 1.16×10^5, U II, 1.29×10^5; Ra, 1.36×10^5. The no. of α-particles per g. of Ra per second is $Z = 3.71 \times 10^{10}$. Metals for which radioactivity has not been observed were tested. No characteristic activity was found for Cu or Zn, but the metals Al and old Pb were shown to contain an amt. of Ra of the order of magnitude 10^{-14} g. per g. of metal. Residues and ppts. from solns. of Zn showed certainly the existence of new activities, the nos. of ions produced by each ray being 0.42×10^5, 0.69×10^5 and 1.01×10^5. H. G.

Individual scattering from hydrogen nuclei in solid bodies. CHR. GERTHSEN. *Ann. Physik* **86**, 1025–36(1928).—An adaptation of the Geiger ion-counter to the detection of individual canal-ray particles is described. Both the dependence upon the angle and the no. of atoms scattered are in agreement with the Rutherford equation for scattering. W. W. STIFLER

The explanation of dust electricity. H. ISRAEL. Landwirtschaftliche Hochschule, Hohenheim, Stuttgart. *Z. tech. Physik* **9**, 289–93(1928).—The theory of Böning (*C. A.* 22, 540) is discussed. His mechanical explanation of the double origin of the charges (collision and tearing off effect) by inertia of the electrons attached to particles different in size was generally confirmed by expts. consisting of blowing dust off plates. Only in those cases where a rough surface of the plate from which the dust is blown tends to give a collision effect additional to the tearing off effect (sulfur) the sign of the charge was the reverse (dust positive) of the expected one. In 71 out of 98 expts. with different material of plate and dust the dust was found negative; apparently even then the mechanical effect outweighs any other source of elec. charge. For a few substances (minium and chalk) the discrepancies are rather regular. B. J. C. VAN DER HOEVEN

Condensation phenomena at different temperatures. C. F. POWELL. *Proc. Roy. Soc.* (London) **A119,** 553–77(1928).—An app is described, somewhat resembling the C. T. R. Wilson "cloud chamber," whereby the supersatn. required to produce condensation on ions and assocd. mols. in dust-free air may be studied, and the necessary data for detg. the expansion ratio are discussed. A temp. range from —25° to +50° has been investigated. Air is important in this process both because it dets. the amt. of H_2O vapor condensed per unit vol. for a given degree of supersatn., and because it prevents evapn. of water from the walls of the expansion chamber. By extrapolation the supersatn. necessary to produce cloudy condensation at temps. up to the crit. point has been estd., and the state of steam at the cloud limit at different temps. has been calcd. The bearing of these results on the *thermodynamic theory of the steam turbine* is discussed. "Atmospheric temp." is shown to be the best for the investigation of atomic phenomena in a "cloud chamber" W. T. RICHARDS

Disintegration of the cathode. IV. The influence of the composition and the physical condition of the cathode on the sputtering process. E. BLECHSCHMIDT AND A. V. HIPPEL. *Ann. Physik* **86,** 1006–24(1928); cf. *C. A.* **21,** 2425.—An extension of the previously developed theory of the disintegration of the cathode based on the localized evapn. of the metal. The modified expression for the disintegration effect is $I = B\cdot\frac{i}{(1 + C_e)}\cdot(1 - r(\bar{T}))\cdot U_1\cdot\frac{3nk}{\chi b}\cdot e^{-\frac{q_a}{k\cdot T}\;\frac{w_1(\bar{T})}{kT}}$ where I is the intensity of disintegration, B the proportionality factor, i the current density, C_e the no. of electrons freed by each ion impact, r the no. of ions reflected, U_1 the energy supplied, n the no. of atoms, $3k$ the heat capacity of an atom, χ the heat cond., b the mean distance between atoms, v_m the sp. vibration of the atoms, e the base of the natural log., q the at. heat of sublimation and w the escaping energy. The disintegration of metals (Ag, Zn, Cd, Sb, Bi, Pb, Mg, Al, Cu) was studied in a mixt. of He and Ne. All metals with a clean surface gave results corresponding with the proposed formula. J. S. REICHERT

Secondary cathodic radiation in Röntgen tubes containing gas and in tubes free of gas. B. WALTER. *Fortschr. Geb. Rontgenstr.* **34,** 129–41(1926); *Physik. Ber.* **7,** 378 (1926).—W. uses his own and Coolidge's expts. In tubes contg. some gas, the secondary cathodic rays, which cause the fluorescence and the heating of the glass wall, are particles of the primary cathodic radiation which were not transformed into x-rays on the anticathode These cathodic rays are not reflected; they are scattered. In gas-free tubes, a similar explanation will account for the production of these secondary cathodic rays. The potential fall at the glass surface was detd. with lycopodium dust, and found to be different for the two sorts of tubes. In tubes contg. gas the glass potential approaches the positive-pole potential; in gas-free tubes it approaches the potential of the negative pole. A. L. HENNE

The relation of hydrolysis to the validity of Beer's law. R. C. GIBBS AND C. V SHAPIRO. Cornell Univ. *Proc. Nat. Acad. Sci.* **14,** 694–700(1928).—Because of the change in the character of the absorbing centers the absorption spectra of aq. or alc solns. of substances which may undergo hydrolysis, or alcoholysis, do not follow Beer's law. This has been shown by a study of the spectra of a no. of phthaleins and related compds. (cf. *C. A.* **20,** 1989; **22,** 1755, 2109). As the concn. of base in the soln. was increased new bands characteristic of the ions appeared in both the visual and ultra violet regions. At high concn. of base, represented in phenolphthalein by a ratio of 232 to 1 mols. of KOH to phthalein, the absorption was independent of the concn. used, thus indicating that hydrolysis was completely prevented. For the smaller ratio of 23 to 1, the absorption is no longer independent of the concn. but is partly influenced by the presence of the mols. of the phthalein in the lactoid form. Analogous results were obtained for resorcinolbenzein, fluorescein and sulfonefluorescein. Since the latter is the stronger acid, its neutral salt is least susceptible to hydrolysis and, therefore, the change in the spectra accompanying a change in concn. is the least. For these 3 compds., in the presence of 1 or 2 mols. of KOH, the bands are characteristic of both the free compd. and the ion and no regular relationship exists between the disappearance of the former and the appearance of the latter. For 20 mols. of KOH all of the neutral bands disappear and the perfect accord in the positions of the bands due to the ions shows the similarity in internal structures. In studying fluorescent media the safest procedure would be to have sufficient excess of alkali present so that no hydrolysis can take place. This can readily be detd. by preliminary observations on the absorption of the soln. at several concns. H. F. JOHNSTONE

Statistical calculation of the Rydberg correction of the s-term. E. FERMI. *Z. Physik* **49,** 550–4(1928).—See *C. A.* **22,** 3826. A. J. KING

A statistical determination of the M-Röntgen terms. F. Rasetti. *Z. Physik* **49**, 546–9(1928).—By the application of his theory of gas degeneration to the electrons in atoms Fermi (*C. A.* **22**, 2314) has shown how a statistical value for the elec. potential of the inner atom can be obtained. The knowledge of these potentials permits the *evaluation of the energy of the quantum state of the electrons in the atom.* R. has calcd. the M-Röntgen terms whose values agree well with the empirical values and serve as a satisfactory proof of the Fermi inner potentials. A. J. King

Quantitative test of Hund's theory of doublet bands of the OH type. E. C. Kemble and F. A. Jenkins. Harvard Univ. *Phys. Rev.* **29**, 607(1927).—Multiple electronic levels in mols are due to different orientations of the electron spin vector relative to the internuclear axis. At low speeds the component of the spin vector parallel to the nuclear axis and at high speed that parallel to the resultant angular momentum is quantized. The resulting distortion of the mol is manifested by bands of doublets or triplets. The effect of the distortion on the rotational term was tested for doublets and observations confirm the theory and check the formula $B:B = (1 \mp z)^2h/8\pi^2 I \pm z^2\Delta_0$, where Δ_0 = term difference for the doublet at zero rotation and $z = h/(8\pi^2 I\Delta_0 - 2h \pm 2h)$, the upper sign going with the lower level of the pair. S. L. B. Etherton

Spectroscopic demonstrator for the exhibition of emission, continuous, and absorption spectra. H. T. Stetson and H. W. Geromanos. *J. Optical Soc. Am.* **16**, 293–4(1928).—The continuous spectrum is produced by an incandescent electric lamp supported 1 ft. from a direct-vision spectroscope. The interposition of a Na flame gives rise to an absorption spectrum, and the latter flame alone to the two Na lines. B. C. A.

"Rainbow" spectra. Robert Saxon. *Chemistry and Industry* **47**, 712–3(1928); cf. *C. A.* **21**, 3829.—There is a bright spectrum from the near side of a highly polished rod when a converging or a diverging beam of light is used. This might be due to groove scratches on the surface acting as a grating. The rods were therefore polished by turning in a lathe and finishing with fine crocus. Thus any grooves must be circular. In each case the spectrum is due to "edge interference" from the slit and lens and the rod merely assists the dispersion. The color of the rod influences the resultant spectrum, Cu killing the blue in the spectrum. To eliminate dazzle the rays should impinge as near as possible to the focus. Rods of highly polished stainless steel are as good as silver, which is too soft. By using a thin tube the absorption effects of various colored materials have been experimented with, and, as each color in the spectrum is given separately, the presence or absence of certain colors is an indication of color strength. Thus with one tube, color strength in solns. can be computed. S. L. B. Etherton

Revision of Rowland's preliminary table of solar spectrum wave-lengths with an extension to the present limit of the infra-red. Charles E. St. John, Charlotte E. Moore, Louise M. Ware, Edward F. Adams and Harold D. Babcock. *Carnegie Inst. Washington Pub.*, **396** (*Papers of Mount Wilson Observatory*, **3**), xxi + 238 pp. (1928).—Fifty-seven elements have been identified in the sun; 32 of these are ionized in part or whole. Of the remaining 35 elements not yet identified in the sun, 17 may be regarded as possible, and 18 as doubtfully possible of detection. A bibliography is also given. Joseph S. Hepburn

Filtration of arc and spark lines in magnetic field by using disruptive discharge in vacuum. Hantaro Nagaoka and Tetsugoro Futagami. Inst. Phys. Chem. Research, Tokyo. *Proc. Imp. Acad* (Japan) **4**, 195–7(1928).—The method of sepg. arc and spark lines in a spectrum by using the disruptive discharge in a strong magnetic field gives ambiguous lines in some cases, owing to the resistance of the air to the motion of the ions. This can be prevented by using the discharge in a vacuum. An app. is described by means of which this can be studied. C. J. West

Transmission and reflection of gold and silver films. W. V. Houston and G. Moore. *J. Optical Soc. Am.* **16**, 174–6(1928).—Measurements of the reflecting power and transmission of sputtered films of Au and Ag as a function of the wave length and thickness were made to det. the most suitable coating for the mirrors of interferometers. Between 5000 and 6000 A. U. Au and Ag are equally good. Above 6000 A. U. Au is superior, since for the same reflecting power the transmission is higher. Below 5000 A. U. Ag is much superior to Au. B. C. A.

Demonstration of partial frequencies in light waves of periodically varying intensity. E. Rupp. *Z. Physik* **47**, 72–88(1928); *Science Abstracts* **31A**, 373.—The everyday effect in the technic of elec. oscillations of superimposing a modulation wave on a fundamental is here extended in a new manner to light waves. The light of the green Tl line is modulated by means of elec. waves of wave length from 100 to 24 cm. by the use of the Kerr effect, and the presence of partial frequencies is demonstrated by suit-

able app., which includes a resonance lamp and an absorption tube contg. Tl vapor. H. G.

Absence of broadening of spectral lines after reflection. Y. ROCARD AND P. DE ROTHSCHILD. *Compt. rend.* **186**, 313-5(1928); *Science Abstracts* **31A**, 367.—The authors consider the theory of the broadening of spectral lines owing to the thermal agitation of the reflecting atoms, which, in consequence of the Doppler-Fizeau effect, modifies the wave length of the reflected light. R. and R. have caused a beam of light to be reflected by 6 or 8 silvered mirrors successively at 45° before entering a Michelson interferometer. In the hope of increasing the velocity of thermal agitation of the diffracting atoms, expts. were made in which some of the silvered mirrors were replaced by polished Al ones. Various fine lines were employed, and the rings at infinity seen in the interferometer with large differences of path were compared with those produced by direct light suitably reduced in intensity by an optical wedge. No change in the visibility of the rings was observed. Calcns. have shown that the method would have made evident $^1/_{200}$ of the actual thermal energy if this had produced the expected Doppler effect. It is suggested that either the diffraction of the waves by the atoms does not constitute the real elementary phenomenon, or that there is a kind of linking between neighboring atoms so that their vibrations are synchronized. H. G.

Light excitation of metallic spectra by means of the metastable state in atoms of noble gases. F. PASCHEN. *Sitzb. preuss. Akad. Wiss.* **1927**, 207-13.—Under certain conditions in a discharge tube, atoms of the rare gases exist in a metastable condition for a relatively long period (10^{-2} sec.). By means of collisions, they can give up energy corresponding with the following voltages: He 19.72. Ne 16.6, A 11.5. When the discharge tube contains a small proportion of foreign atoms, liberated by heat or elec. sputtering from Al, Mg, Zn or Cd, the spectra of these metals are excited by collisions between atoms of metal and metastable rare-gas atoms. In the neg. glow, neutral atoms are excited and a considerable no. of simple, positively charged ions of the metallic foreign substance also make their appearance spectroscopically manifest; thus, in addn. to arc lines, all the terms of the first spark spectrum are excited provided that they exceed T, where $T = T_0^+ - E$, T_0^+ being the deepest term of the first spark spectrum of the metal and E the excitation voltage of the rare gas. In the pos. glow, more neutral atoms are excited than in the neg. glow. In a side tube, branching from near the pos. column, it was possible to detect metastable Ne atoms (by absorption of the 6402 A. U. Ne line) at a distance of 2 cm. from the pos. light. In this region of the tube, neutral atoms of metal vapor alone undergo excitation. Only such terms in the first spark spectrum as are greater than T' make their appearance, T' being defined by $T' = T_0 + T_0^+ - E$, T_0 being the fundamental term of the arc spectrum. Excitation therefore seems to be due to collisions, and the emission is much more intense than in expts. using electronic impacts. The interpretation is fully substantiated by the exptl. data. B. C. A.

Electrified spherical films and fine structure of spectral lines. L. DÉCOMBE. *Compt. rend.* **186**, 68-70(1928); *Science Abstracts* **31A**, 340.—To account for the fine structure of spectral lines, Sommerfeld has advanced a remarkable explanation based on the consideration of pseudoelliptic orbits with sep. radial and azimuthal quantizations, but postulating, according to Bohr's process, a jump of electrons from one orbit to the other. It is a simple matter to liberate the theory from this strange postulate; all that is needed is to bring in as a factor the pulsations of the orbital electrons (assimilated to elastic spherical films) and to identify the luminous frequency with that of the beats intervening between the pulsations of 2 electrons moving in 2 different orbits, as has already been done with circularorbits (*C. A.* **22**, 3833). In the present case, however, one must consider the vibratory frequency of the electronic film as a function not only of the kinetic energy (constantly variable when the orbit is not circular), but of the total energy which, on the contrary, remains const. for the whole duration of the motion. On this condition alone can the frequency of the beats have a fixed value. The treatment of the problem is mathematical. H. G.

Highly accurate method for interferometric wave-length determinations, and its application to a preliminary determination of krypton lines for a German standard meter in terms of light waves. A. P. WEBER. *Physik. Z.* **29**, 233-9(1928).—In view of the use of interferometric methods in fixing standards of length, the relative merits of the Fabry-Perot etalon and the Koster abs. interference comparator methods have been studied at the Physikalisch-Technischen Reichsanstalt. The Kr spectrum possesses advantages over the Cd spectrum in that the latter shows only one entirely suitable line, the standard red line, whereas several lines are available in the discharge from pure Kr. The following wave lengths have been measured relative to the Cd

line 6438.5033 A. U. (in air at 20°, 760 mm., and 10 mm. moisture): green Cd, 5085.8490, red Kr, 6456.3241, yellow, 5870.9463, yellowish green, 5649.5924, violet, 4502.3790, green, 5400.5919, the 2 lines last named being measured relative to the other Kr lines. Pending further investigations in different countries on the Kr yellowish green line, the use of the Cd red line as a standard is continued. B. C. A.

Undulating theory of two electron orbits. A. W. Conway. *Proc. Roy. Irish Acad.* **38,** 18–28(1928); *Science Abstracts* **31A,** 341–2.—Two-electron orbits in which the 2 electrons rotating about a nucleus of charge $2e$ repel each other with a force varying as the inverse cube of their distance, are dealt with by Schrödinger's method, and the results obtained compared with those given previously (*C. A.* **21,** 3541) on the basis of the Bohr-Sommerfeld-Wilson quantization principle. Certain differences in the spectral terms given by the 2 methods are recorded. H. G.

Construction of wave-length scales for spectrograms. G. Barr. *Trans. Optical Soc.* (England) **29,** 22–7(1928).—A method is described by which an approx. scale of wave lengths may be projected geometrically on to a spectrogram from a uniformly divided scale when a no. of easily recognizable lines have been identified. B. C. A.

The titanium oxide bands. A. Christy and R. T. Birge. *Nature* **122,** 205 (1928).—The fine structure analysis of the blue-green Ti bands (cf. *C. A.* **22,** 4063) has now reached the point where it is possible to draw certain definite conclusions regarding the mol. responsible for the radiation of these bands. These conclusions are based on a complete verification of the combination principle, using some 1500 lines measured in the 3 bands 0-0, 1-0 and 0-1 with wave lengths at 5167 A. U.; 4955 A. U. and 5448 A. U., resp. Each band consists of 3 R and 3 P branches. The new fact that the individual bands have a triplet structure is practically certain proof that they are due to a mol. with an *even* no. of electrons, *i. e.*, neutral TiO. The values of the moments of inertia for the upper and lower levels are $(56.76 \pm 0.03) \times 10^{-40}$ and $(51.87 \pm 0.03) \times 10^{-40}$, resp., corresponding to a nuclear sepn. of 1.694×10^{-8} cm. and 1.619×10^{-8} cm. W. F. Meggers

Continuous absorption in sodium vapor. B. Trumpy. *Z. Physik* **47,** 804–13 (1928).—T. has already shown that there is good agreement between his results with the chief line series of Na and Li and the requirements of Schrödinger's theory. The theory not only describes the discontinuous line spectrum but also predicts the structure and intensity of the continuous spectrum arising with smaller wave lengths at the series limit. The coeff. of absorption of the boundary continuum falls rapidly with diminishing wave length until at about 2300 A. U. it is half the value of the series boundary. The app. consists of an Fe tube with quartz windows at the end; it is heated by the secondary current of a small transformer. The const. source of light was the spark between 2 disks rotating at const. speed. The exptl. results are compared with the theory of Sugiura. At the series boundary, the boundary absorption passes continuously into line absorption and an apparent fall in absorption with increasing wave length near the boundary is connected with the imperfect resolving power of the spectrograph. At high temps. a continuous absorption between the chief lines of the series was observed as well as at the boundary continuum. However, the absorption was depressed with falling temp. S. L. B. Etherton

Fine structure of sodium D lines. L. Dobrezov and A. Terenin. Opt. Inst., Leningrad. *Naturwissenschaften* **16,** 656(1928).—The observations of Schüler (*C. A.* **22,** 3356) were confirmed by measurements of luminescent Na atom rays by a 30-cm. Lummer plate perpendicular to the ray, reducing the Doppler effect to 6° abs. temp. On splitting of D_1 and D_2 a double set of doublets was found of 0.01 A. U. order. Ghost pictures were excluded. B. J. C. van der Hoeven

Energy distribution in the continuous spectrum of the aluminum spark under water. Ilse Wyneken. *Ann. Physik* **86,** 1071–88(1928).—The energy distribution in the spectrum of the underwater spark between Al electrodes was detd. by a photographic-photometric comparison with the known energy distribution of the C arc. At 2850 A. U. there is a definite max., the intensity being approx. $3^1/_2$ times as great as in the neighborhood of 4500 A. U. On the assumption of a purely thermal radiation this would correspond to 10,000° K. However, the black-body radiation curve for this temp. is much flatter than the exptl. curve obtained. A comparison of Cu with Al gave no indication of a dependence upon electrode material. The falling off of the curve in the extreme ultra-violet is not due to absorption by H_2O. A bibliography is included. W. W. Stifler

Measurement of the life period of metastable mercury atoms. T. Asada, R. Ladenburg and W. Tietze. Kaiser Wilhelm Inst., Berlin-Dahlem. *Physik. Z.* **29,** 549–50(1928).—Previous measurements used atoms generated electrically. Hence

there is an objection that ions of relatively long life period are also formed and that after a certain life period part at least of the demonstrated metastable atoms are produced from them without having overlived their period of existence. Optical excitation of metastable atoms avoids this objection. Such excitation is based upon the stepwise principle discovered by Fuchbauer. The metastable $3P_1$ atoms are generated by the ultra-violet resonance line 2537 and are photographed on a rotating-disk app. described. Previous measurements gave a life period of 15×10^{-4} sec. It now seems possible to investigate the influence of external conditions upon the life period and to test Foote's rule. S. L. B. ETHERTON

Spark spectra of mercury vapor. JOSEPH VALESEK. *J. Optical Soc. Am.* **17**, 102-6(1928).—In 1923 L. and E. Bloch (*J. de phys.* **4**, 333 (1923)) published a list of 300 spark lines of Hg which were obtained by observing an electrodeless discharge. As the length of the spark gap in the primary of the Tesla coil increased, the spark lines could be sepd. into 3 groups which were designated as the E_1, E_2 and E_3 spectra. The present investigation deals with the location of the E_3 radiation potentials. These potentials probably give the energy required to produce excited and ionized Hg^{+++}. With app. practically like that described before (*Phys. Rev.* **29**, 817 (1927)) the photographic density of various lines was obtained as a function of the accelerating potential. Crit. potentials were located at 108 and at 118 v. Intensity measurements show that these lines are excited by a single impact because the intensities increase in the same proportion as the electron current, whereas if 2 collisions were required to bring the atoms into the initial excited state, the no. of excited atoms, and therefore the intensity of the lines, should increase as the square of the current. W. F. MEGGERS

Intensity changes in mercury lines under varying discharge conditions. TAKE HORI. *Z. Physik* **49**, 259-68(1928).—Intensity curves of Hg lines in high and low voltage arc are given, and it is concluded that the changes are due to differences in electron velocity. GREGG M. EVANS

Remark on the work of Hori on the intensity of mercury lines. E. FUES. *Z. Physik* **49**, 269(1928); cf. preceding abstr.—F. prefers selective direction of colliding electrons, rather than velocity, as a cause of intensity changes. GREGG M. EVANS

New hydrogen-mercury bands in the ultra-violet. H. JEZEWSKI. *Przemysl Chem.* **12**, 492-3(1928).—The structure of heretofore unobserved bands of a mixt. of H_2 and Hg vapor excited to radiation by means of oscillating discharges is analyzed and interpreted. These bands extend from $\lambda = 2537$ to $\lambda = 2190$ A. U. A. C. Z.

Duration of Stark effect in hydrogen and nitrogen. H. KERSCHBAUM. *Ann. Physik* **84**, 930-8(1927).—The duration of the Stark effect in $H\beta$ and $H\gamma$ has been detd. from observations on canal rays and is found to be const.; the duration of the negative Ni band 4278 A. U. is 2.54×10^{-8} sec., *i. e.*, approx. twice that of the spark-excited band. B. C. A.

The second-order Stark effect of hydrogen. H. RAUSCH VON TRAUBENBERG. Deutsche Univ., Prag. *Naturwissenschaften* **16**, 655-6(1928).—The Stark effect of first and second orders was observed in fields of 420,000 v. per cm. The method was the one of Stark with sep. field, the canal rays entering through a 0.1-mm. slit in the cathode of the elec. field. The second-order effect (red shift of the cleavage components) is represented in 6 graphs for various components of $H\gamma$. The Schrodinger values (larger than those of the old quantum theory (Wentzel, *Z. Physik* **38**, 518 (1926), Waller, *C. A.* **21**, 1059) were in agreement with the data. The proportionality with F^2 (F is field) was well borne out. B. J. C. VAN DER HOEVEN

Some unclassified lines of oxygen in the ultra-violet. J. J. HOPFIELD. Univ. of California. *Phys. Rev.* **29**, 923-4(1927).—Although among the strongest in the O spectrum, the line 1152 A. U. and the triplet 988.67 A. U., 990.13 A. U and 990.73 A. U. have not yet been fitted into series. It is suggested that these are due to O I, and the triplet may be an unresolved group similar to one in S at approx. 1480 A. U., which contains 8 lines, with the normal triplet sepn. occurring twice. W. W. S.

The NH band and the dissociation energy of nitrogen. E. GAVIOLA. Johns Hopkins Univ. *Nature* **122**, 313-4(1928).—Using R. W. Wood's arrangement for the optical excitation of Hg vapor (*C. A.* **21**, 3830), G. has observed the NH band at 3360-70 A. U., when about 4 mm. of N_2 and a few thousandths of a mm. of H are admitted to the quartz tube contg. the excited Hg vapor. The intensity of the band is proportional to the square of the intensity of the exciting light. That is, the concn. of atomic N must be proportional to the sq. of the intensity of the arc, or to the sq. of the no. of excited Hg atoms. This relation can be interpreted if we assume that at. N is formed by 3-body collisions of N_2 mols. with two excited Hg atoms, $N_2 + 2Hg' \longrightarrow 2N + 2Hg$. However, if this is the mechanism, the max. energy available for the dissocn

of N_2 is 9.8 v., coming from the 2^3P_1 Hg atoms with 4.9 v. energy. It appears, therefore, that the dissocn. energy of N_2 is less than, or about, 9.8 v., and not 11.4 v. as was calcd. by Sponer and Birge. R. J. HAVIGHURST

The structure of the spectrum of ionized argon (A II). T. L. DE BRUIN. Univ. Amsterdam. *Verslag Akad. Wetenschappen Amsterdam* **37**, 553–61(1928); cf. *C. A.* **22**, 2326.—On the basis of the Heisenberg, Pauli and Hund schemes are derived 3 base terms of the ionized A atom, 3P and metastable 1D and 1S. In the spectrum 180 lines were classified; 46 out of 59 theoretical energy levels were identified; the others are outside the visible spectrum. The ionization potential was detd. to be 27.75 ± 0.05 v. A detailed photograph and tabulated data are presented. B. J. C. VAN DER HOEVEN

The fundamental vibration quantum of gaseous alkali halides. K. SOMMERMEYER. Univ. Gottingen. *Naturwissenschaften* **16**, 653–4(1928).—In thick layers (15 to 20 cm.) regular distances of diffuse bands (3 to 10) in the long wave range of the alkali halide absorption spectrum could be observed. By proper pressure and temp. regulation up to 25 members were found over several hundred A. U.; these bands follow the continuous spectrum, the distances converge towards red. The source is assumed to be vibration of normal mols. at the temps. used of 750° to 1100°. Good agreement with Born and Heisenberg's fundamental vibration quantum (*Z. Physik* **23**, 388 (1924)) was found For CsI also higher vibrations were examd. Only for high dispersion fine structure (for KI and NaI) is noticeable, indicating a small dissocn. energy of the excited state (atom bond). From this apparent practical equality of excitation energy and dissocn. energy of the halides the latter can be calcd. from the short-wave bands. The results agree fairly well with those obtained in other ways. B. J. C. v. D. H.

The first ultra-violet characteristic frequencies of some simple crystals. R. HILSCH AND R. W. POHLE. *Z. Physik* **48**, 384–96(1928).—The ultra-violet absorption spectra of *TlCl, TlBr, TlI*, $PbCl_2$, PbI_2, *AgI* and *I* have been detd. Thin sheets of approx. 10 μ thickness were prepd. by pressing the molten crystal between amorphous quartz plates. Thicknesses were detd. by interference methods The absorption maxima occur at the following wave lengths (in μ): TlCl, 245 and 216; TlBr, 273 and 239; TlI, 289, approx. 250 and approx. 220; $PbCl_2$, 271 and 219; PbI 303 and 278 The max. for I is at approx. 350 with decreasing absorption toward shorter wave lengths at least down to 200 μ. The absorption spectra of two *alkali halide "phosphors,"* KI + Tl and KI + Pb were detd. and compared with those of pure TlI and PbI. The maxima of the various alkali halide "phosphors" in which Tl and Pb are the "active metals" do not exactly coincide with those of the pure Tl and Pb halides, yet the agreement in the positions of the first bands is so good and the maxima are so much sharper in the "phosphors" that their use for the detn. of absorption maxima is suggested as a possible exptl. simplification Care must be used in the choice of cation in the solvent material (*e. g.*, KI in the above instances), since it must be sufficiently chemically and crystallographically similar to the "effective metal" cation (*e. g.*, Tl) to produce the increased sharpness without displacing the band. R. L. HERSHEY

The ultra-violet absorption of iodides in solution. GUNTER SCHEIBE. *Sitzb. phys. med. Sozietat Erlangen* 58–9, 2 pp.; *Chem. Zentr.* **1927**, II, 2151; cf. *C. A.* **20**, 0130; **21**, 1932 –The absorption by iodides in H_2O and alcs. is examd. to 186μμ. In aq. soln., LiI, NaI, KI, MgI_2 and SrI_2 have a max. of absorption at 225μμ, a min. at 200μμ, and a 2nd max. at about 192μμ. In EtOH, the 1st max. is at 216μμ, the min. at 204μμ, while the 2nd max. is unchanged as compared with H_2O. The height of the max., referred to the same I-ion concn. is always the same; therefore the absorption of the I ion is identical in iodides with an alkali or an alk. earth as the base. In aq. soln. of ZnI_2 and CdI_2, the 2 max. and the min. have the same height as in the case of the alkalies and the alk. earths. In alc. soln., the absorption curve for ZnI_2 is displaced towards the ultra violet and lowered by a half. With CdI_2 in alc. soln., a displacement towards the red occurs, which is still more distinct with HgI_2 in EtOH. Thus with Cd and Hg in EtOH, a new kind of linkage appears. According to these findings, the change between homopolar and heteropolar linkage in alc. soln. may be assumed to be at the transition from Zn to Cd. G. SCHWOCH

The scattering of light by free electrons according to Dirac's new relativistic dynamics. O. KLEIN AND Y. NISHINA. Universitets Inst. for teoretisk Fysik, Köbenhavn *Nature* **122**, 398–9(1928). –K. and N. undertake calcn. of intensity of light scattered by an electron under the influence of a plane, unpolarized, monochromatic wave train, based on D.'s development of the original Dirac and Gordon treatment. K. and N.'s result is: $I = I_0 \frac{e_4}{2m^2c^4r^2} \cdot \frac{(1+\cos^2\theta)}{\{1+\alpha(1-\cos^2\theta)\}^3} \cdot \left[1 + \alpha^2 \frac{(1-\cos\theta)^2}{(1+\cos^2\theta)\{1+\alpha(1-\cos\theta)\}}\right].$

where I is intensity at distance r from the electron of the light due to a Compton process where the secondary light quantum is emitted in a direction forming an angle θ with the incident beam of intensity I_0 and frequency ν, and $\alpha = h\nu/mc^2$. This formula differs from the corresponding one of the older theory by the last factor (in square brackets) and the deviations of the formulas are of the order of α^2, while the earlier expression differs from J. J. Thomson's classical expression by quantities of the order of α. For $\lambda = 0.022$ A. U., where D. had compared his formula with Compton's measurements the deviations are large. The above formula leads to one for s, the scattering coeff., due to the Compton effect of a substance contg. N electrons per unit vol. in which if α is small compared to unity, $s = (8\pi/3)(Ne^4/m^2c^4)(1 - 2\alpha + (26/5)\alpha^2)$, which differs from D.'s formula in that D.'s term $(21/5)\alpha^2$ is here replaced by $(26/5)\alpha^2$, and the order of differences is about α^2, as before. But for $\alpha = 1$ the values are about 50% higher than D's. For small values of α, the differences are small. If K. and N.'s formula is used for calcg. λ of cosmic penetrating radiation the calcd. values are considerably smaller than those hitherto assumed. A. P. SACHS

Negatively modified scattering. M. N. SAHA, D. S. KOTHARI AND G. R. TOSHNIWAL. Allahabad University. *Nature* **122,** 398(1928).—Einstein and Ehrenfest (cf. *C. A.* **18,** 627) deduced thermodynamically a scattering of light by the particles of the assembly which it traverses. Smekal (cf. *C. A.* **18,** 2834) pointed out, that light of frequency ν, after scattering, would possess frequencies ν, $\nu + \nu_k$ and $\nu - \nu_k$, where $h\nu_k$ is the energy diff. between the excited state and the normal state of the particles causing the scattering. Raman and Krishnan (cf. *C. A.* **22,** 1907) have confirmed Smekal's prediction. S.'s theory explains the Wood resonance spectra of vapors of Na, K and halogens. Anti-Stokes lines (*i. e.*, those of shorter λ than the original light) are equally spaced and are due to neg. modified scattering, which is a phenomenon intermediate between pure scattering (as by fog particles which cause scattering but remain themselves physically unchanged) and pure absorption. This explanation should be capable of extension to free electrons and will probably afford an easy explanation of the origin of bright and broad bands in spectra of Novae, and of winged lines in solar spectrum. A. P. SACHS

Wave-length shifts in scattered light. ARTHUR E. RUARK. Mellon Inst., Pittsburgh. *Nature* **122,** 312-3(1928).—It is suggested that the new type of radiation emitted by org. liquids when illuminated with the light of a Hg arc, described by Raman and Krishnan (*C. A.* **22,** 2884), be investigated with regard to the question of the existence of a time lag between reception of the incident light and emission of scattered radiation of modified wave length. Such an investigation might decide whether the secondary radiation is a fluorescent emission following the absorption process after a finite interval, or the scattered light of modified wave length predicted by Kramers and Heisenberg in their correspondence principle treatment of dispersion. R. J. H

Polarization of resonance radiation and breadth of spectral lines. A. ELLETT. State Univ. of Ia. *Proc. Iowa Acad. Sci.* **34,** 283(1927).—Observations of the polarization of the D line resonance radiation of Na indicate that the transition probabilities for the various components of the Zeeman pattern are substantially in agreement with the predictions of the so-called sum rule. Observations in relatively strong fields show the effect of non-uniform distribution of intensity in the exciting spectral line. The assumption that the distribution of energy in the exciting line is due practically entirely to Doppler effect leads to equations for the variation of polarization with field strength which are well verified experimentally. Any broadening of the line by collision or by a coupling effect is evidently small in comparison with the Doppler breadth. W. G. GAESSLER

The aurora and its spectrum. J. C. MCLENNAN. *Proc. Roy. Soc.* (London) **A120,** 327-57(1928).—Bakerian lecture delivered June 28, 1928. W. F. MEGGERS

Line spectra and the periodic arrangement of the elements. SAUL DUSHMAN. *Chem. Reviews* **5,** 109-71(1928). W. F. MEGGERS

An investigation of the absorption spectra of water and ice, with reference to the spectra of the major planets. J. C. MCLENNAN, R. RUEDY AND A. C. BURTON. *Proc. Roy. Soc.* (London) **A120,** 296-302(1928).—The principal unidentified bands in the spectra of the 4 planets, Jupiter, Saturn, Uranus and Neptune, are at 5430, 6190 and 7200 A. U. Photographs of a continuous spectrum were made through columns of water 4 m. and 21.5 m. long; they show a diffuse absorption band with its sharper edge at about 5990 A. U., extending to about 6350 A. U., a second band extending from about 6560 to 6700 A. U. and a third band beginning at about 7000 A. U. The absorption of ice was also investigated with lengths up to 14 m.; the absorption bands appear to be shifted toward the longer wave lengths. It is believed that the red absorp-

tions in the spectra of the 4 major planets can be attributed to water in the liquid state but the band in the green at 5430 A. U. still remains unidentified. W. F. MEGGERS

The absorption spectrum of iodine in ethyl alcohol. ALAN BATLEY. *Trans. Faraday Soc.* **24,** 438–52(1928).—The results of investigations by previous workers on the absorption spectrum in the visible and ultra-violet regions of I dissolved in EtOH show a marked lack of agreement. It is considered important to ascertain the actual cause of the discrepancies, and to det. the true absorption curve. The ultra-violet and visible absorption exhibited in solns. of I_2 in EtOH is now investigated (250$\mu\mu$ to 720$\mu\mu$) by means of a quartz spectrograph and sector photometer. Measurements are made with ozone-satd. EtOH which decomposes the H iodides as formed. The true absorption curve shows only one max. of wave length 447$\mu\mu$ with general absorption in the far ultra-violet. The max. recorded at 370$\mu\mu$ and 290$\mu\mu$ by previous observers are proved to be due to the formation of HI_3 in the soln. The HI_3 has been isolated in the solid form upon gelatin, and is shown to exhibit in this state, an absorption max. at 368$\mu\mu$. In general there are, in solns. of I_2 in EtOH, opposing reactions—(a) the photochem. reaction giving HI and HI_3 and (b) the photochem. oxidation of H iodides by dissolved O_2, the relative velocities of the reactions being influenced by various factors. Thus, the absorption curve exhibited will depend on the method and speed of observation, on the light source used, on the water content of the solvent, on the diln. of the soln. and on whether the solns. were exposed to daylight, either before or during examn. W. F. MEGGERS

Further investigations of the spectrum of singly ionized carbon (C II). A. FOWLER AND E. W. H. SELWYN. *Proc. Roy. Soc.* (London) **A120,** 312–26(1928).—In a previous paper (*C. A.* **18,** 1612) it was shown that a considerable number of lines attributed to singly ionized C could be arranged in a regular system of doublet series. Numerous lines which appeared to belong to C^+ remained unclassified, but further analysis of the spectrum has been greatly facilitated by subsequent theoretical developments. In accordance with Hund's theory, quartet as well as doublet terms are to be expected, and several of these additional terms have now been identified. The present communication gives an account of the newly classified lines, and includes improved measurements for some of the lines previously considered. A list of 160 lines, 7236 to 534 A. U., attributable to C^+, is given; 110 of these have been classified. W. F. MEGGERS

Structure of induction spectra of rare gases. A. T. WILLIAMS. *Univ. nac. La Plata, estudio ciencias* No. **82,** 253–81(1928); *Science Abstracts* **31A,** 376.—The purpose is to establish the usefulness of excitation by the induction method to sep. different orders of the spectra of any element. In the spectra of A is established the correspondence between theoretical terms and Meissner's terms in order to the arrangement of lines in multiplets. There is also classified with Meissner's terms 2 new lines, 3354, ($1s$ – $6p_8$) and 3355, 4($1S_3$ – $6p_3$). In the spectra of Kr there are classified 49 const. sepns. and 2 groups of lines. In the spectra of X the const. sepns. obtained are 195, and there are also several groups of lines. The validity of the method of Bloch and Déjardin (*C. A.* **18,** 1432) is considered. H. G.

Quantum theory of the Ramsauer effect. J. R. OPPENHEIMER. *Proc. Nat. Acad. Sci.* **14,** 261–2(1928).—The Ramsauer effect can be accounted for by consideration of electronic resonance and spin. Two first-order cross-sections for the elastic collision of an electron and a hydrogenic atom can be calcd., corresponding with initial orbital wave-functions, resp., symmetric and anti-symmetric in the coördinates of the impacting electron and the at. electron. The symmetric wave-function gives a greater cross-section than that calcd. without resonance, while the anti-symmetric function gives a cross-section vanishing from some small velocity for each angle of deflexion. The total cross-section shows a sharp min. at about 1 v. In the general case, both symmetric and antisymmetric wave functions will occur, but for atoms having only paired electrons (*e. g.*, He, A, CH_4) the cross-section is given by the anti-symmetric function alone and may, therefore, pass through a min. for sufficiently low velocities. For any particular case the whole problem must be solved. Minima in cross-sections have been observed for A and Kr. B. C. A.

Study of the spark spectra of sulfur, selenium and tellurium in the Schumann region. P. LACROUTE. *J. phys. radium* **9,** 180–4(1928).—Spectra of S, Se and Te between 1235 and 2200 A. U. by means of a spectroscope with a grating in vacuum. Light is produced by discharge without electrodes in rarefied vapors. Tables are given. L. D. R.

Change of fluorescence in ultra-violet light. MAX HAITINGER AND VIKTOR REICH. *Z. angew. Chem.* **41,** 982–3(1928).—Ether exts. of wines showing fluorescence on filter paper strips when sealed in tubes contg. air or CO_2 do not lose their fluorescence either

in the light or dark. After several weeks in the light, however, the color diminishes in either air or CO_2. Other substances on paper, salicylic acid, glycine, fluorescein and wine ext. lose fluorescence entirely in Hg arc light. Filtering the light by glass weakens the original color. G. B. TAYLOR

Ultra-violet absorption spectrum of chlorophyll in alcoholic solution. ELSA LEWKOWITSCH. Imperial College of Science and Technology, London. *Biochem. J.* **22,** 777-8(1928).—Absorption maxima are shown at 4200 and 3250 A. U. The curve rose steeply below a wave length of 2400 A. U. BENJAMIN HARROW

The luminescence of solid nitrogen under cathode-ray bombardment. J. C. McLENNAN, H. J. C. IRETON AND E. W. SAMSON. Univ. of Toronto. *Proc. Roy. Soc.* (London) **A120,** 303-11(1928); cf. *C. A.* **21,** 3831.—The previous app. was improved by the use of a new Coolidge tube capable of yielding high-velocity cathode rays outside of the generating tube. The stream of electrons impinged on solid N_2 frozen in liquid H_2. It produced a bright yellow-green luminescence The N_2 was produced from $NaNO_2$ and NH_4Cl, and dried over CaO and P_2O_5. Fresh N_2 was admitted every $^1/_2$ hr. during an expt. The spectrum was photographed from 2000 to 8600 A. U There are two distinct series of bands; a narrow set extending into the ultra-violet beginning at 2347 A. U.; and broad bands degrading into the red, beginning at 3105 A. U. Vegard's bands N_1, N_2, N_3, N_4 were also photographed. A new band was found at 6725 A. U., N_1, N_2, and N_4 could be seen in a hand spectroscope. N_1 vanished when the source of excitation was removed, while N_2 and N_4 had appreciable periods of decay. N_1 is thermoluminescent, since it appeared on warming the solid N_2. The decay curves for bands N_2 and N_4 are divided into 2 and 3 sections, resp., which obey the law $I(a + bt)^2 = 1$, where I is intensity, t is time, and a and b are consts. These lines may be due to adsorbed H_2, though proof is not conclusive. N_1, N_2 and N_4 are phosphorescent bands ARTHUR FLEISCHER

Triboluminescence and crystal luminescence. H. LONGCHAMBON. *Bull. soc franç. min.* **48,** 130-211(1925) - Triboluminescence is brought about by electrical radiation, which causes gas present at fractures to become luminescent The phenomenon is often complicated by phosphorescence and fluorescence. A no. of cases of crystal luminescence, where destruction of the crystal is accompanied by a rise of temp , are due to triboluminescence. In other cases, the effect is probably due to the existence of an elec. double layer at the crystal surface Triboluminescence does not occur when crystals are broken along their cleavage planes, if these are not perpendicular to an axis of pyroelectricity. B. C. A.

The fluorescence of hydrocarbons. A. ANDANT. *Chimie et industrie* **Special No.,** 267-9 (April 1928); cf. *C. A.* **21,** 2432 -Attempts to photograph the fluorescence spectra of liquid nonene and duodecene gave no appreciable image, even after 26 hrs.' exposure. With 3 hrs.' exposure fluorene and chrysene gave very characteristic curves. Under excitation by light of λ = 3132 A U., the fluorene spectrum showed 4 bands with max. intensity at 3805, 4040, 4340 and 4620 A. U , resp , and the chrysene spectrum 6 bands with max. intensity at 3950, 4040, 4150, 4340, 4690 and 4980, A. U., resp. Under excitation by light of λ = 2652 A. U. the chrysene spectrum shows only the last 4 above-mentioned bands. It should be noted that these 2 compds have 2 bands in common (4040 and 4340 A. U.); but it will require further work on other compds. to ascertain whether these bands are characteristic of compds. contg. 2 C H rings joined at their summits. A. PAPINEAU-COUTURE

The quenching of mercury fluorescence by the addition of gases. O. OLDENBURG. Göttingen Univ. *Z. Physik* **49,** 609-18(1928); cf. *C. A.* **22,** 1729. - The quenching of the resonance fluorescence of Hg vapor by N_2 and A is contrasted. These gases are equally effective in quenching at room temp., while at 750° A has five-fold the effect at 20° and N_2 does not act at all. This difference is due to the action of temp on the transition probabilities involved; a Hg atom on impact with A reverts to the normal state, while N_2 favors reversion to the metastable 2^3P_0 state (cf. Cario and Franck, *C. A.* **20,** 3126). H. R. MOORE

Fluorescence of mercury vapor. R. W. WOOD AND V. VOSS. *Proc. Roy. Soc.* (London) **A119,** 698-706(1928); cf. *C. A.* **22,** 1726.—Practically all of the stronger arc lines of the Hg atom are exhibited by Hg vapor when excited by the light of the Al spark, which can be absorbed only by the Hg mol. (band absorption). The intensity of these lines varies as the square of the intensity of the exciting light. With few exceptions, all of the arc lines increased in intensity with superheating, whereas the bands were practically unaffected in tubes free from H_2O vapor. Fluorescence of the vapor could not be obtained without simultaneous distn. if H_2O vapor was present. The

intensity of the Hg hydride bands increases in proportion to the H_2O content of the tube and to the degree of superheating. A. J. KING

The cathodophosphorescence of erbium in calcium oxide. SVEN FAGERBERG. *Ann. Physik* **86**, 435–46(1928).—The phosphorescent spectrum of Er in CaO is excited by an electron stream of a few tenths milliamp. intensity and a p. d. of 5000 v. It consists chiefly of line groups spread over the wave length domain 6800–3100 A. U. Superposed on this spectrum is a series of bright and diffuse continuous bands between 4100 and 3600 A. U., originating from the CaO substrate. H. R. MOORE

The phosphorescent combustion of sulfur. HARRY J. EMELÉUS. Imperial Coll. Sci., South Kensington. *J. Chem. Soc.* **1928**, 1942–50. —The ignition of S in O_2 occurs at 285–325°, but just below the ignition point the oxidation is accompanied by a bluish white luminescence. The phosphorescent flame changes into the normal flame as the temp. is raised. A search was made for oxides of S more volatile than SO_2, such as SO. The results indicate, however, that the sole products of the luminous oxidation are SO_2 and SO_3. Certain org. vapors inhibit the oxidation, and it is presumed their action consists in the quenching of active patches on the surface. H. R. MOORE

Phosphorescence of calcium tungstate induced by x-rays. F. E. SWINDELLS. *J. Optical Soc. Am.* **16**, 165–73(1928).—The rate of decay of a very phosphorescent sample of Ca tungstate, detd. photographically, was found to fit the Becquerel equation, $I^{-x} = a + bt$, from 30 sec. to 5 min. after exposure to x-rays The phosphorescence of this sample could be detected after 50 hrs. under conditions when the phosphorescence of normal Ca tungstate disappeared in 1 min. The intensity of the phosphorescence was found to be closely proportional to the product of the intensity of the x-rays and the time of exposure up to a limiting value, beyond which there was a negligible increase. B. C. A.

Quick and slow decay of luminescence of phosphors of various types of atoms. HELMUT MOSER. *Ann Physik* **85**, 687–710(1928). —With oxide phosphors the quick decay outweighs the slow decay, but with selenide phosphors the reverse is the case Sulfide phosphors, in general, show both processes equally strongly. The total emission shows a strong increase from O, S to Se as generic atoms and Ca, Sr to Ba as alk earth atoms. B. C. A.

Spectrum of calcium-strontium sulfide-samarium mixed phosphors. M. TRAVNIČEK. *Ann. Physik* **84**, 823–39(1927). —The phosphorescent system $[Ca_mSr_n]S$ — Sm + LiF has been investigated The Ca phosphor shows a sharp red emission line at 6058.6 A U., while the Sr phosphor has a corresponding line at 6036.8. With this emission as a criterion, it is found that the transition through mixts. of Ca and Sr is perfectly continuous as is to be expected if the phosphorescence center is a definite compd. Each component of the phosphor exercises some effect on the emission. In exactly the same way, the x-ray investigation shows that the lattice const. varies continuously. The cryst. nature of the sulfide diluent is of great importance in detg. emission from the phosphor, since lattice const. and frequency vary in the same sense. Freshly prepd. mixed phosphors are unstable, showing aging phenomena. Striking differences are recorded between fresh and one-year-old $MgSO_4$, $BaSO_4$ and MgO samarium phosphors both in respect of wave length and intensity of the emission bands. The interpretation of the results is discussed. B. C. A.

Spectrum of calcium-strontium sulfide-samarium mixed phosphors. M. TRAVNIČEK. *Ann. Physik* **85**, 645–6(1928); cf. preceding abstract.—A correction of a misstatement by Tomaschek (*C. A.* **22**, 1280). B. C. A.

Theory of extinction of photoluminescence in uranyl salt solutions. S. I. VAVILOV. Inst Physics and Biophysics, Moscow. *Z. Physik* **50**, 52–7(1928).—By mathematical treatment of a uranyl salt mol. as a Brownian particle a previous empirical formula, (cf. *C. A.* **22**, 3097) $\bar{t} = \alpha(\eta/c)$, is confirmed, where $\bar{t}$ is the av. time between activation of a mol. and its first extinguishing collision, η viscosity and c concn. of the soln. and α a const. Approx. values for α are given. V. accounts for a discrepancy of 50 times between his theoretical and empirical results by solvation of mols. G. M. E.

Phosphorescence, fluorescence and chemical reaction. E. C. C. BALY. *Chemistry & Industry* **47**, 914–25(1928).—B. seeks an explanation of the mechanism of chem. reaction from observations made in the allied fields of phosphorescence, fluorescence and absorption spectra. At present neither the radiation theory nor the activation-by-collision theory is adequate to account for known facts. Definite evidence is obtained in favor of the radiation theory. The radiation hypothesis states that the first stage of a chem. reaction is the activation of each mol. of the reactant by the absorption of one

quantum of energy which is called the crit. quantum of activation. Evidence gained from the exptl. investigation of the phenomena of photoluminescence gives strong support to the reality of this crit. quantum of activation but entirely disposes of the possibility of a mol. gaining this quantum by a single absorption process. It is probable that the activating quantum is greater than the actual energy of activation, the excess energy appearing as fluorescence. The connection between the observed heat of reaction and the crit. increments of activation, derived by the radiation hypothesis, is extended to photochem. quanta. The *photosynthesis* of carbohydrates from H_2CO_3 is discussed. The activation of H_2CO_3 must take place in 2 stages, namely, partial activation by absorption with the formation of a mol. state capable of absorbing some rays within the visible spectrum, whereby the activation is completed by photochem. means. The stability of the complex is affected by temp. This may be compared with the photo-activation of a phosphor, the initial complex being an absorption complex of CO_2 and $NiCO_3$. There exists a lower temp. below which the reaction will not take place; an intermediate temp zone in which the reaction will take place with a definite temp. coeff.; and an upper limit of temp. at which all reaction again ceases. Thus photosynthetic and photoluminescent processes are analogous. M. F.

Chemiluminescence between alkali metal vapors and zinc halides. M. Polanyi and G. Schay. Kaiser Wilhelm Inst., Berlin. *Z. Physik* **47**, 814-8(1928).—Vapor of Na and K at 0.01 mm. pressure were brought in contact with vapors of $SnCl_4$, $SnBr_4$ and SnI_4. A certain amt. of reduction occurred. In the app. described and with an excess of the Zn salt reduction to the dihalide takes place and there is no deposit of Zn on the walls of the app. Hence the luminescence is easy to observe. To the naked eye, $SnCl_4$ gave a blue light, $SnBr_4$ gave a green and SnI_4 a yellow color. The luminescence is intense and continuous; it is most intense at the center and falls off symmetrically at the sides. No sharp boundary is to be observed. Though it is to be expected that the continuous spectrum was due to combination of the free components P. and S. could not substantiate this. Thus, with $SnCl_4$ they could not find any HCl when H was admitted to the system. P. and S. calc. the *heat of combination* of 3 and of 4 atoms of Cl in $SnCl_4$. Since the explanation that the light is due to combination is excluded, it is assumed that the manifestation of light ensues as a result of transformation of the energy set free in the reaction. S. L. B. Etherton

The decomposition of ammonia by high-speed electrons. J. C. McLennan and Gilbert Greenwood. Univ. of Toronto. *Proc. Roy. Soc.* (London) **A120**, 283-95 (1928).—Cathode rays were obtained in the reaction chamber through a Ni window of a Coolidge cathode-ray tube. Preliminary expts. at 1 mm. of NH_3 showed that temp. effects were not present, and that it was necessary to take precautions, such as coating reaction chamber with tin foil to prevent a silent-discharge decompn. An expt. with A showed no change in pressure, indicating absence of temp. effect. With const. amperage and 1 mm. of ammonia, the decompn. was a linear function of the applied voltage. A crit. potential of 82 kv. was found below which the cathode beam did not pass through the window. With const. current of 0.2 milliamp. at 115 kv. the % decompn. decreased with rise in pressure. The initial rate of change was const. with changing initial pressure of NH_3, but increased with increasing voltage for const. pressure of NH_3. The ratio, no. of NH_3 mols. decomposing to no. of electrons causing decompn. is independent of pressure, while it increases with increase in speed of electrons. Expts. with quantities of N_2 and H_2 in initial mixt. showed that N_2 increases the amount of NH_3 decomposed, while H_2 decreases it. N_2 does not change the rate, while H_2 lowers it. The ordinary mass-action laws cannot be applied to the equil. under these exptl. conditions. Arthur Fleischer

Distribution in direction of the relative velocity of the optical dissociation products of sodium iodide. Allen C. G. Mitchell. Inst. of Physics, Göttingen. *Z. Physik* **49**, 228-35(1928).—NaI dissociates under optical excitation to form an I atom and an activated Na atom. The absorption by Na vapor of fluorescence from NaI vapor excited from Cd and Zn sparks, was measured parallel and at right angles to the exciting beam. Results showed that there was no detectable direction tendency in the velocity of the dissociating atoms, even in the presence of magnetic fields. G. M. E.

Relation between current density and cathode fall of the glow discharge with the use of a guard-ring cathode and correction for the rise in temperature of the gases. A. Güntherschulze. Physikalisch-Technische Reichsanstalt. *Z. Physik* **49**, 358-79(1928).—The cathode consisted of an Fe cylinder and guard-ring. The total diam was 11.5 cm. and the height 3.0 cm. It weighed 2.3 kg., giving a heat capacity sufficiently large to prevent appreciable warming during a series of expts. The av. raised temps. of the gases in the fall-space were calcd. and used in the Sutherland equation to calc.

the mean free path. The latter, rather than the gas pressure, is the detg. variable. The gases He, A, H_2, N_2 and O_2 were studied. They were purified (except O_2) in the discharge vessel by a glow discharge with a Na-K cathode. The cathode was freed from foreign gases by prolonged spattering. Au foil and P_2O_5 were used to remove Hg and H_2O from the O_2. The cathode fall was detd. by increasing the distance between the electrodes until the anode glow disappeared At this distance the potential between the electrodes is equal to the cathode fall. Helium is the only gas for which (const. cathode fall) $l \cdot \sqrt{i}$ = const., and d/l = const., where l is the mean free path, i is the c. d. and d is the width of the fall-space. The c. d. is the lowest for He and increases but little with cathode fall. The slopes of the c d.-cathode fall curves increase with the gases in the order He, H_2, Ne, N_2, O_2 and A. The c. d. for the latter increases rapidly with increasing cathode fall. The width of the fall-space (const. l) becomes const. in He at 300 v., but in Ne and A decreases rapidly with increasing cathode fall.
J. E. Snyder

Telescopic observation of cathode and anode points. Carl Barus. *Science* **67,** 248–9(1928).—Expts. with mucronate electrodes show that a bright and a "dark" (surface glow at the edges of the anode) type of spark follow the extinction of the cathode glow. A negatively charged body at a fixed distance extinguishes the cathode glow. The effect of the neg. body at various positions shows that the rays emitted from a mucronate anode are pos. ions.
J. E. S.

Velocity of particles sputtered by disruptive discharges. Hantaro Nagaoka and Tetsugoro Futagami. Inst. Phys. Chem. Research, Tokyo. *Proc. Imp. Acad.* (Japan) **4,** 201–4(1928).—By photographing the sputtered particles on a film rotating with a known velocity and measuring the tracks, the velocity of the particles can be found. The mean velocities (in m /sec.) found are: W 43, Mg 37, Ce 90, but as the speed depends on voltage, current strength and the form of the electrodes, these values are indicative only of its order of magnitude.
C. J. West

Condensible gas modifications formed under the influence of electrodeless discharges. James Taylor. *Nature* **122,** 347(1928).—When a liquid-air trap is maintained in a gas subjected to an electrodeless discharge in glass vessels, condensible products are formed. When H is the gas water is the condensible product. The O is derived from the glass by electrolysis. When O is the gas, the condensible product gives a spectrogram identical with that of CO_2. The C comes from the glass. At the beginning of a run in H, H_2 disappears for each electronic charge conveyed but later only H disappears for each charge. The O disappears more easily than H. In the absence of a liquid-air trap, continued discharge may disintegrate the H_2O or CO_2 previously formed. The glass walls retain the mols. formed during a clean up by such a discharge.
F. E. Brown

The problem of the normal cathode drop. R. Seeliger. *Naturwissenschaften* **16,** 665–9(1928); cf. *C. A.* **21,** 3536.—A review is given of qual. theories on the explanation of the "normal" cathode potential drop in a gaseous discharge, the maintenance of the cathode dark space, etc. Different theories are based on (1) the assumption of dynamic stabilization of ion and electron liberation before the cathode to maintain their proper concns., (2) space charge assumptions using Poisson's equation, (3) most favorable potential distribution (Compton and Dällenbach), (4) (author's theory) equil. at the discharge edge between diffusion and radial electrostatic forces. Definite conclusions have not been obtained so far.
B. J. C. van der Hoeven

Luminous beads of metal particles sputtered by disruptive discharge in magnetic field. Hantaro Nagaoka and Tetsugoro Futagami. Inst. Phys. Chem. Research. *Proc. Imp. Acad.* (Japan) **4,** 106–8(1928).—Photographs are given showing the peculiar beaded tracks of metal particles sputtered in a magnetic field. Various explanations are offered, the most probable cause being the alternate formation and loss of an oxide film on the surface of the particle.
C. J. West

Electrical discharges in gases at low pressures. Irving Langmuir. *Z. Physik* **46,** 271–99(1927).—An analysis is advanced of the motion of ions and electrons in gases at pressures such that the mean free path is of the order of 1 cm. with particular reference to discharges between a straight wire emitting electrons surrounded by a coaxial cylindrical anode. Methods of detg. the velocity distribution of the ions and electrons are described, and it has been shown that in Hg vapor the Maxwellian distribution obtains. The "electron temp." corresponding with the observed velocity distribution is not a function of the current, and it is therefore concluded that the ions and electrons are not in thermal equil. with the gas mols., the temp. of which in such discharges is but little higher than that of the walls of the contg. vessel. "Electron temps." up to 80,000°

have been observed in discharges in Hg vapor; somewhat lower values are obtained in A and in H. B. C. A.

Chemical reactions under electrodeless discharge. S. S. BHATNAGAR, RAMA KRISHNA SHAYMA AND N. G MITRA. *J. Indian Chem. Soc.* **5**, 379–82(1928).—Naphthalene was subjected to the glow discharge of a Tesla coil *in vacuo* The compd. thus obtained was purified and an analysis was made. The formula derived from cryoscopic and combustion expts. is given as $C_{24}H_{20}O$. The Tesla discharge changes: $PbSO_4$ to $PbSO_3$ and PbS, $CaSO_4$ to $CaSO_3$, $KBrO_3$ to KBrO and KBr, KIO_3 to KI and I_2, $KClO_3$ to KClO and KCl and $PbSO_4$ + Mg to PbS and MgO_2. These reactions are to be studied further. RAYMOND H. LAMBERT

The contraction of gaseous hydrogen under the influence of electric discharge. R. DELAPLACE. *Compt. rend.* **187**, 225–7(1928); cf Wendt and Landauer, *C. A.* **16**, 1343.—Purified H_2 is subjected to 50,000 v. discharge in a sealed Pyrex tube for periods up to 4 hrs, the contraction noted and the residual gas analyzed.

Time of discharge, hrs	% H_2 lost	% CO – CH_4 found	% contraction
0	0	0	0
1	4.0	1 8	2.0
2	4.6	3.2	1.0
4	4.7	4.2	1.7

The contraction is irreversible and is not due to polymerization of H_2 to H_3. G. C.

Photoelectromotive force in selenium. R. L. HANSON. Cornell Univ. *Phys Rev.* **29**, 924(1927) —A detailed study of the e. m f developed in a Se cell by illumination showed that it is not due to any thermal effect. For the same illumination the e. m. f. is independent of the current through the cell and over wide ranges it is proportional to the intensity of illumination For a given intensity of illumination the e. m. f. is a max. in the region of λ = 490. W. W STIFLER

The photoelectric current as a function of field and fatigue. A. BLANC. *Compt. rend.* **187**, 171–3(1928). – A discussion of the form of the curve representing the photoelec. current as a function of the field The frequency below which the photoelec phenomenon is produced is greater for Ag than Al. The distribution of the speed of electrons depends upon the frequency of the light if it is monochromatic and upon its compn. if it is not. Fatigue seems to be accompanied by a progressive increase in the frequency limit. E G. VANDEN BOSCHE

Studies in the experimental technic of photochemistry. VI. The energy distribution of the uviol lamp. E. BEESLEY AND H. N. RIDYARD. Univ. London. *J. Phys. Chem.* **32**, 1342-5(1928); cf. *C. A.* **22**, 3841.—The energy distribution of the uviol lamp has been examd. for the wave lengths 579, 546, 405, 365, 313 and 303 mμ, the app. of Franklin, Maddison and Reeve (*C. A.* **19**, 2300) being used. Its comparison with the quartz lamp does not recommend it as a source of light energy, but the quant information obtained may supplement early published photochem work. H. R. M

Photochemical studies. VII. The photochemical decomposition of formic acid liquid and vapor. W. N HERR AND W. ALBERT NOYES, JR. *J. Am. Chem Soc* **50**, 2345–50(1928); cf. *C. A* **22**, 2717 -- An energetical study has been made of the photochem. decompn. of HCOOH, with the unfiltered light of an Hg arc as the source of radiation. After exposure to this radiation, the HCOOH was condensed with liquid air and the decompn. products remaining in the gaseous phase were removed by a Toepler pump. In this way it was found, for the vapor, that 0.52 mol. per quantum were uncondensed by liquid air and 0.39 mol were condensed, making a total of 0.91 mol. on the av. of decompn. products per $h\nu$ absorbed The absorption band max. for the vapor was taken as 250mμ. For the liquid, with a reaction vessel fitted with quartz windows, a quantum yield of 0 46 mol. was obtained by taking 300mμ for the band max With Pyrex glass, the value was 0.14 (band max at 330mμ). The reaction mechanisms proposed assume the existence of Ramsperger and Porter's bimol. form $(HCOOH)_2$ (*C. A.* **20**, 1950). H. R. MOORE

The influence of the intensity of illumination on the velocity of the photochemical union of bromine and hydrogen, and the determination of the mean life of a postulated catalyst. FRANK BRIERS AND DAVID L. CHAPMAN. *J. Chem. Soc.* **1928**, 1802–11.—Exptl. data are presented which confirm the assertion of Bodenstein and Lütkemeyer (*C. A.* **19**, 2453), that the velocity of HBr synthesis is proportional to the square root of the intensity of light. It has been established, further, in this and other researches, that the union of H_2 and Br_2 is due to ephemeral catalysts (atoms or active mols.). The mean life of this catalyst was estd. to be 0.063 sec., a sectored disk being used to permit intermittent light of const. intensity to fall on the mixt. The periods of light

exposure then bore a const. ratio to the periods of darkness. The value obtained would be longer under less intense illumination. H. R. Moore

Photochemical reaction between bromine and tartaric acid in aqueous solution. II. Jnanendra Ghosh and Kalipada Basu. *J. Indian Chem. Soc.* **5**, 343–60(1928).—The induction period diminishes with increase in the frequency and intensity of incident light, increases as the initial concn. of tartaric acid increases, diminishes as initial concn. of Br increases and increases very considerably if HBr is added previous to exposure to light. The induction period increases as the initial p_H of soln. decreases in a mixt. of Br, tartaric acid and sodium hydrogen tartrate. The unimol. velocity const. decreases as initial concn. of Br increases, increases as concn. of tartaric acid increases, increases very considerably if part of the tartaric acid is replaced by Na H tartrate, diminishes if HBr is added before exposure to light, decreases with time, increases rapidly with increase in frequency and intensity of light and varies approx. as the square root of the light intensity. A quantum of light transforms a large no. of Br mols. into HBr. III. **The mechanism of the reaction.** *Ibid* 361–72.—The first stage of the reactions is activation of Br mols by absorption of light, the atom of Br brings about the photochem. reaction. The rate of reformation of Br_2 mol. is then $K_2[Br]^2$. Br atom reacts with O_2 as $K_3[Br]^2[O_2]$. O_2 may come from H_2O, in which it is dissolved, or from the light-dark reaction as $Br_2 + H_2O \longrightarrow 2HBr + O$. Photo-inhibitors may also be destroyed by at. Br. They may also be responsible for the photo-bromination of tartaric acid. An equation is derived which involves the const. for the first dissocn. of tartaric acid It is shown that a unimol. velocity of reaction takes place if the concn. of Na H tartrate is sufficiently great Raymond H. Lambert

Photochemical action of bromine on maleic and fumaric esters. J. Eggert, F. Wachholtz and R. Schmidt. *Z. Elektrochem* **33**, 542–5(1927); *Oesterr. Chem.-Ztg.* **30**, 110.—The effect of changes in the exptl conditions on the values of ϕ and α was studied, where ϕ is the ratio of the no. of mols. converted to the no. of quanta absorbed, and α is the ratio of Br mols. added to the no. of quanta absorbed. For the Et ester, ϕ and α are independent of variation of the ester concn. and of the radiation intensity; with the Me ester and free maleic acid, there is no dependence at high concns., but at low concns ϕ decreases with decreasing ester concn, and with increasing intensity. Both ϕ and α are markedly dependent on temp in all cases. ϕ is independent of the Br concn. and α is proportional to this concn. in all 3 cases. The effect of change of wave length of the active light (blue, 4360 A U.; green, 5470 A. U.; ultra-violet, 3650 A U.) is as follows: Et ester, $\phi_{bl}/\phi_{gr} = 1.9$; $\alpha_{bl}/\alpha_{gr} = 2$; Me ester, $\phi_{bl}/\phi_{gr} = 2.3$; $\alpha_{bl}/\alpha_{gr} = 1.9$; free maleic acid, $\phi_{uv}:\phi_{bl}:\phi_{gr} = 5:4:1$. A reaction mechanism is pictured in which the Br atoms combine with the unsatd. ester mols, E, to form relatively stable compds of the type EBr, before they are able to recombine to form mols. In the conversion of maleic into fumaric ester, the collision of Br atoms with the maleic ester mols. is supposed to favor the change from the maleinoid to the fumaroid form, until the Br atom is eventually fixed to form the radical EBr. In the additive reaction it is assumed that at the moment of collision between the Br atom and the ester mol., a Br mol. which may collide simultaneously will be taken up to form dibromosuccinic ester, with re-liberation of the Br atom. B. C. A.

Photobromination of cinnamic acid and stilbene. III. Rukmini M. Purkayastha and Jnanendra C. Ghosh. Dacca Univ *Quart. J. Indian Chem. Soc.* **4**, 553–9(1927).—Expts. in yellow light confirmed the mechanism previously deduced (*C. A.* **22**, 1151) from expts. in green and in blue light. There is an induction period in the reaction, followed by an after-effect when the source of illumination is withdrawn. If the reacting system is again exposed to light after the induction period and after-effect are over, the reaction passes through another short period of induction. From this it is concluded that a complex intermediate is formed in the process of photobromination E. H.

Photochemical ozonization and its relation to the polymerization of oxygen. Oliver R. Wulf. Univ. of Calif *J. Am. Chem. Soc.* **50**, 2596–2604(1928); *Proc. Nat. Acad. Sci* **14**, 356–8.—Warburg's classical expts. on ozonization (*C. A.* **6**, 20 and following papers) indicate that the absorption of radiation may be due to a polymer, O_4, which decomposes to give O_3 and O. Change of absorption with pressure agrees with this idea. Calcn. gives K_p = 1.2 g./cc. for the equil. const. of $2O_2 \rightleftarrows O_4$, which probably is significant only in order of magnitude. William E. Vaughan

The influence of the intensity of the incident light on the velocity of some photochemical reactions. B. K. Mukerji and N. R. Dhar. Allahabad Univ. *J. Phys. Chem.* **32**, 1308–30(1928).—A detailed study is made of velocities of 14 photochem. reactions as a function of intensity of radiation. All reactions were carried out in a ther-

mostat. A 1000-w. lamp was used as the source of radiation, and intensities were controlled by varying the size of the aperture to the reaction vessel. The velocities of the reactions fall into 3 well-defined groups; those in which velocity is proportional to the square of the intensity of radiation, those in which it is proportional to the square root of the intensity, and lastly proportional to the intensity. Reactions pre-eminently photochem. are likely to be proportional to the square root of the intensity. This occurs for the interaction of K oxalate, NH_4 oxalate, Na malate, $NaNO_2$ with I_2. The authors ascribe this to chem. changes between atoms of I_2. H. R. MOORE

Photochemical changes in hydrocarbons. I. Condensation of ethane under the action of ultra-violet rays. STANISLAW TOLLOCZKO. *Przemysl Chem.* **11**, 245–53 (1927).—The gases were submitted to ultra-violet radiation λ = 2300 – 4000 A. U. while kept in a quartz envelope surrounding a Hg lamp. CH_4 was not affected whether it was continuously exposed or was allowed to flow through the reaction chamber. C_2H_6 gave about 0.25 g. light colorless condensate which analysis showed to be composed of a mixt. of hydrocarbons, most of which was C_6H_{14}. The gaseous phase contained H_2 and CH_4. On the basis of chem. kinetics equations are derived for velocity of the reaction and for pressure within the app. at any time during the procedure. These equations are applicable to condensation of C_2H_6 to higher hydrocarbons, and are checked well by exptl. results. A. C. ZACHLIN

The photoöxidation of organic compounds by means of dichromates. I. PLOTNIKOV. *Chem.-Ztg.* 52, 669–71(1928).—Qual. expts. conducted during summer months gave the following results: $K_2Cr_2O_7$ soln. satd. with H_2 showed only slight cloudiness, the H_2 being therefore but slightly dissociated into atoms. Pure C treated similarly gave no change in 3 mos. Addn. of Mn, Co, Cu, UO_2^{II} and Fe salts as catalysts gave no results Colloidal C caused marked action, giving a voluminous ppt. CH_4 acted as did H_2, and illuminating gas caused slightly greater action. C_2H_4 and C_2H_2 reacted readily. MeOH gave a ppt. of $Cr(OH)_3$ and formed HCHO, but no HCOOH. EtOH yielded MeCHO and a brown ppt. (Cr chromate) of unknown compn. When $(NH_4)_2Cr_2O_7$ was used instead of the K salt, NH_3 and MeCHO were evolved. PrOH gave a dark brown color and a ppt., and formed EtCHO and traces of EtCOOH. iso-PrOH gave MeCOMe and AcOH with HCOOH. MeCOMe gave a brown soln. contg. AcOH, HCOOH and traces of corresponding aldehydes. $K_2Cr_2O_7$ and especially $(NH_4)_2Cr_2O_7$ dissolve in ethylene glycol, the solns. quickly become dark green and alkaline and contain glycolaldehyde and glyoxal. The green color arises from the Cr salts of glycolic, glyoxylic and oxalic acids. Glycerol reacts quickly also, giving a green soln alkaline in reaction and contg. glyceraldehyde, dihydroxyacetone and glyceric acid. C_6H_6 gave no visible change, but traces of C_6H_5OH and $(COOH)_2$ were found. The addn of $FeCl_3$ as catalyst gave a slight change, with the formation of traces of C_6H_5OH, $(COOH)_2$, glycol and a greenish yellow material of unpleasant odor. A satd. C_6H_5OH soln. treated with $K_2Cr_2O_7$ altered greatly in 10 days, giving a viscous green-brown material Quinone, pyrocatechol, hydroquinone, an oily substance and a glue-like brownish material were found. Toluene (in 4 months) yielded a soft yellow substance of pleasant odor, and tolu balsam. Tetralin similarly gave a little homophthalic acid and condensation products of unknown compn. *o*-Xylene gave *o*-toluic aldehyde and acid in small amounts. *m*-Cresol yielded *m*-toluic aldehyde and acid and an oily substance, likewise in small amounts. *p*-Cresol gave a little formic acid and xylenol Hydroquinone and $K_2Cr_2O_7$ gave a brownish red soln., evolved CO_2, and could not be filtered by any means tried. A few drops of HNO_3 caused a gelatinous ppt. to form. Quinhydrone was found; upon distn. phthalic acid was obtained, and in the residue was a brittle resin. Evidently the quinone formed at first later combined with the remaining hydroquinone. With resorcinol a viscous liquid was formed, brownish red in color, and after removal of the Cr salts a greenish fluorescent liquid remained. Phloroglucinol had been formed, together with a trace of pyrogallol. From pyrocatechol there resulted quinone in small quantities, quinonepyrocatechol and hydroxyhydroquinone. *o*-Cresol decomposed with the evolution of CO_2, the liquid sepd. into two layers, the lower, green in color, contg. $Cr(OH)_3$, unaltered cresol and a brownish red gummy mass, and the upper, colorless contg. benzoic acid and some oxalic acid. With $C_{10}H_8$ and α-$C_{10}H_7OH$ no change was noted. Cresyl blue 2BS became red and fluoresced. Nile blue behaved like it. Ethyl green, cyanine, naphthylene blue altered in the dark, but more quickly in the light. Trypan blue, indulin, dahlia, aniline green, malachite green, naphthol green, iodo green, nigrosin, Trypan red, erythrosin, indigo carmine blue, gentian violet, Guinea green B and G, brilliant safranin, aurantia, safranin, lition carmine, carmine II, rose Bengal, Rhodamin B, Hoffmann violet, methyl violet, crystal violet and cresyl (echt) violet underwent no change. $C_6H_5NH_2$ rapidly

darkened, forming aniline black and very small amts. of quinone. Mesitylene became brown and partly resinified; with Et_2O a terpene-like liquid of a yellow color was isolated and an aldehyde was detected. Pseudocumene also became brown and resinified; an aldehyde was detected, but no terpene or acid. This indicates that terpene-formation is related closely to the symmetrical structure of the mol. *p*-Aminophenol became brown, yielding much quinone and NH_3. Dihydroxyanthraquinone became brown, evolved CO_2 and formed quinone. Triphenylmethane was not changed. Isopulegol yielded only about 1% of isopulegone. Isoeugenol oxidized to a resin contg. small quantities of vanillin; probably the formation of an opaque gelatinous deposit on the walls of the vessel stopped the reaction. *n*-Octanol also caused a deposit on the walls of the container, soon stopping the reaction. Uranyl nitrate accelerated the change. An aldehyde was identified and the soln. became alk. Safrol gave an aldehyde, the walls soon became coated and the reaction stopped; uranyl nitrate accelerated the change.

W. C. Ebaugh

Influence of adsorbed ions on the absorption of light by silver bromide. K. Fajans, H. Fromherz and G. Karagunis. *Z. Elektrochem.* 33, 548–54(1927).—In explanation of the previous work of the authors (cf. *C. A.* 21, 1594), there is the possibility that long wave lengths are absorbed by a bromide body to the same extent as by a Ag body, but that the red rays are active only in the latter case because reaction with the excess of Ag salt binds the Br and prevents back reaction. To test this, the influence of adsorbed ions on the light absorption of AgBr was studied. Sols contg. about 1 millimol. of AgBr per l. were prepd., with excess of $AgNO_3$ or of KBr varying from 0 to 1 millimol. per l. The degree of coagulation of these sols became stationary after about 12 hrs.; during the next 2 hrs., which was the time necessary to carry out a measurement of absorption, it did not vary more than 1–2%. With increase of concn. of the excess salt the degree of coagulation decreases, but to a different extent for the 2 salts. The coagulation tends to a const. value with increase in the concn. of the salts, because the surface of the AgBr becomes satd with the ions. This const. value is obtained with 60% excess of $AgNO_3$ (0.6 millimol. per l.), and with 40% excess of KBr. The ratio of the degree of coagulation in the 2 cases is 1:0.35. The dispersity of a sol contg. 100% excess of $AgNO_3$ was the same as that of a sol contg. 5% excess of KBr. These 2 sols were used for the purpose of absorption measurement. AgBr-gelatin emulsions were also studied, various "bodies" being produced by bathing in solns. of the perchlorates of Ag, Tl and Na and KBr. Curves were obtained by plotting the log of wave length against the log of the extinction coeff. With aq. sols, the extinction coeff., *k*, is practically the same for both sols in the region λ 3800–4470 A. U., and the curves are approx. linear. The slope of the curves is slightly greater than that deduced from Rayleigh's formula. For the AgBr-gelatin plates, plotting log of wave length against log of extinction (*i. e.*, log *kcd*), the curves are again straight lines in the spectral region λ 3800–4700 A. U., both for the pure AgBr and for plates bathed in Ag or Na perchlorate, and KBr. The curve for pure AgBr lies slightly above those of the other 3, which practically coincide, and remain nearly straight lines into regions of long wave length. The slope is again slightly higher than that demanded by Rayleigh's formula. This shows that in this case, and also in the case of the aq. sol, scattering is largely responsible for the extinction. There is a large difference between the extinction of the Ag body and that of the bromide body and the pure AgBr which is not due to coagulation by the salts in which the plates were bathed. The extinction of the Ag body, even in the near ultra-violet, is greater than that of the bromide body; *i. e.*, the absorption of the AgBr is influenced by adsorbed ions. The difference between the extinctions of the Ag body and the bromide body increases on passing from the ultra-violet to the yellow, with both plates and sols. This indicates an extension of the light absorption into the longer wave lengths by the absorbed Ag ions. It is assumed that the size of the absorbed light quantum depends only on the absorption of energy in the first phase of the process of transfer of an electron from a bromide to a Ag ion, *i. e.*, the sepn. of an electron from a bromide ion. It will therefore depend on the condition of the bromide ions in the AgBr space-lattice. It is so markedly different in the case of NaBr from that of AgBr, because of the deforming action of the Ag ions on the bromide ions in the surface of AgBr. The shift of absorption due to adsorbed Ag ions is due to their distorting effect on the neighboring bromide ions in the AgBr lattice.

B. C. A.

Protected silver hydrosols. VI. Formation of sols by irradiation. J. Voigt. *Kolloid Z.* 45, 319–22(1928); cf. *C. A.* 22, 10.—Irradiation of dil. $AgNO_3$ or Ag_2O solns. free from reduction centers does not produce reduction. Pure gum arabic, in 0.7% soln. or more dil., previously irradiated or not, does not reduce the Ag soln. Irradiation

of a mixt. of the 2 solns. produces reduction and total pptn. with visible light, and only the formation of a sol with ultra-violet light. The ultramicroscopic particles of gum act as reduction centers. The ultra-violet radiations thus show a peptizing or charging effect, which is more evident in its dissolving power on the ppt. It is also possible to prepare Ag solns. by means of ultra-violet light in the presence of radiation centers which themselves do not act as protective colloids. G. CALINGAERT

The formation of a polymeride of carbon monosulfide by ultra-violet irradiation of carbon disulfide. Absorption spectrum of carbon disulfide in carbon tetrachloride. W. DORAN AND A. E. GILLAM. *J. Soc. Chem. Ind.* **47,** 259-60T(1928).—The red-brown solid obtained by the action of a Vita glass-screened Hg-vapor lamp on mixt. of CS_2 and CCl_4 is examd. and found to be a polymeride of CS. The absorption spectrum of CS_2 in CCl_4 is discussed. The portion of the curve due to CCl_4 is below the wave length transmitted by Vita glass (275$\mu\mu$) and thus CCl_4 can safely be used as a solvent in photochem. reaction occurring with rays on the long wave length side of 275$\mu\mu$. M. F.

Phototropic compounds of mercury. S. V. RAGHAVA RAO AND H. E. WATSON. Indian Inst. of Science. *J. Phys. Chem.* **32,** 1354-65(1928).—An exhaustive study has been made of the photographic characteristics of 20 Hg compds. of the type $X{\cdot}HgCNY$, HgX_2 and $2HgY$ (X = Cl, Br, I, HS, HSe, CNS, CNSe; Y = O, S, Se). These yellow or brown compds. become black by exposure to sunlight and regain their original color by standing 1-3 days in the dark or by heating. A spectroscopic examn. was carried out for 10 of the more sensitive ones. A 100-c. p. pointolite lamp was used as the source of radiation in the visible and an Fe arc for the ultra-violet. The threshold wave length for darkening was 5500 A. U. and less; the sensitivity max., however, were shifted towards the green by dyes such as erythrosin, methyl green, eosin and methylene blue. Reversal was promoted by red light, also by heat. The temp. coeffs. of direct and reverse reaction velocities were 1.9, the av. value for chem. changes of the ordinary type. The effects produced were directly proportional to light intensity. H. R. M.

Excited systems formed by the absorption of light. LOUIS A. TURNER. *J. Phys. Chem.* **32,** 507-15(1928).—Primary absorption may cause displaced electron orbits (Bohr theory), ions (by photoelec. effect) or such mol. modifications as have energy content higher than the original system. Many chem. changes may result from these excited systems independent of the absorption mechanism. HARRY B. WEISER

Absorption coefficients. HENRY G. DE LASZLO. *J. Phys. Chem.* **32,** 503-6(1928).—The measurement of absorption coeffs has been made chiefly on pure liquids and to a certain extent recently on vapors and gases. Two general methods are employed: (1) photographic methods and (2) photoelec. cell and microphotometric methods. The principles underlying each are discussed. HARRY B. WEISER

Relation between photochemical and ionization reactions. S. C. LIND. *J. Phys. Chem.* **32,** 573-5(1928).—A review of observations on a few photochem. and ionization reactions leads to the conclusion that there is great need for the examn. of more reactions by methods of activation, ionization and excitation under identical conditions in order to establish the relationship between the quantum yield $M/h\nu$ of the photochem. reaction and the M/N yield of the ionic reaction. HARRY B. WEISER

Photochemical clustering. B. LEWIS. *Nature* **121,** 792(1928).—Macdonald's views of the mechanism of the photochem. decompn. of N_2O (*C. A.* **22,** 2112 and private communication) are discussed; the agreement between the value for $M/h\nu$ and that for M/N in the α-ray reaction (Lind, preceding abstr.) suggests clustering, but a general theory of photochem. clustering is not proposed. The view is, however, more acceptable for reactions involving assocn. or polymerization. B. C. A.

Experimental technic for quantitative study of photochemical reactions. GEORGE SHANNON FORBES. *J. Phys. Chem.* **32,** 482-502(1928).—A selective and crit. survey of the technic for the study of chem. reactions evolved by light from external sources from the red to the beginning of the Schumann region. Sections are devoted to general sources of information; sources of light (a) with approx. continuous spectra, and (b) with discontinuous spectra; and quant. measurement of radiation intensity. HARRY B. WEISER

Displacement of equilibrium by light. WILDER D. BANCROFT. *J. Phys. Chem.* **32,** 529-72(1928).—A no. of photochem. processes are reviewed in detail on the theory of the displacement of equil. by light. It is concluded that this theory offers the simplest interpretation of the facts when confined to reversible equil. The conditions must be such that a photochem. change takes place and that the rate of this change shall be greater than the sum of the rates of the reverse reaction in the dark and in the light. The amt. of the displacement of equil. by any given light usually decreases with rising temp., since raising the temp. usually increases considerably the rate of the re-

verse reaction in the dark relatively to the rates of the photochem. reactions.

HARRY B. WEISER

Quantum processes in photochemistry. HUGH S. TAYLOR. *J. Phys. Chem.* **32**, 516–27(1928).—Photochem. processes are discussed in the light of the quantum theory with especial reference to depolarizers, inhibition and such processes as the hydrogen-halogen reaction, the oxidation of quinine and the reduction of Fehling solution. The attempt to couple the concept of quantized absorption with the net photochem. yield has not been successful. Indeed, in the case of some workers this suggestion of equivalence has given rise to mistrust of the general idea of quantized absorption which is basic to all modern studies of photochem. processes and is demanded by phys. theory. The situation may be met by the two laws of photochemistry, the first that of Grotthuss and Draper, the second: "That the absorption of light is a quantum process involving one quantum per absorbing mol., the photochem. yield being detd. by the thermal reactions of the system produced by the light absorption." HARRY B. WEISER

Radiant energy from flames (GARNER) **2**. Röntgen spectrographic observations on cellulose (HERZOG, JANCKE) **23**. Thermal conductivity of metals and non-metals (EUCKEN) **2**. The importance of the absorption method in the chemistry of the terpenes (MÜLLER) **10**. Absorption spectra of some phthaleins and sulfonephthaleins of phenol and *o*-cresol (GIBBS, SHAPIRO) **10**. The use of photoelectric spectrophotometry in microanalysis (V. HALBAN, ZIMPELMANN) **7**. The meaning of radioactivity in the history of the earth (HAHN) **8**. The relation between the photoelectric and the photographic effect in Ag bromide (BUTLER) **5**. Fluorescence of papers (FALLOT) **23**. The effect of radioactivity on the chlorophyll-containing and the non-chlorophyll-containing cells (STOKLASA, *et al.*) **11D**. Rare gases from thermal springs and the great earthquakes of April 14 and 18, 1928, in Bulgaria (PÉNTCHEFF) **8**.

GROTRIAN, WALTER: **Graphic Darstellung der Spektren von Atomen und Ionen mit ein, zwei und drei Valenzelektronen.** Tl 1, 245 pp.; Tl. 2, 168 pp. Berlin: J Springer. M. 34; bound, M. 36.40.

JOHNSON, R. C.: **Spectra.** London: Methuen & Co., Ltd. Monographs on physical subjects. 104 pp. 2s. 6d., net.

LECOMTE, JEAN: **Le spectre infrarouge. Recueil des conférences. Rapports de documentation sur la physique.** Paris: Les Presses Universitaires de France. 468 pp. F. 80.

Apparatus for the measurement of radium radiations and like applications. LUCIEN MALLET and MME. DANNE (nee MARIE-THÉRÈSE ROUFFIAC). Fr. 635,266, May 31, 1927.

4—ELECTROCHEMISTRY

COLIN G. FINK

Oxidation reactions in the luminous arc electric furnace. K. V. KERPELY. *Zentr. Hutten Walzwerke* **31**, 471–5; *Chem Zentr.* **1927**, II, 2005.—A review of oxidation reactions during the production of steel in the arc furnace, their influence and effects on the metal and slag. C. C. DAVIS

Industrial electric heating. The single-phase arc furnace. N. R. STANSEL. *Gen Elec. Rev.* **31**, 483(1928).—A review of the Detroit and Booth furnaces and operation. C. G. F.

Making electric manganese steel. J. H. HRUSKA. *Iron Age* **122**, 455–6(1928).—The generally accepted specifications for austenitic Mn steels is as follows: less than 1 1% C; 11.5–13.5% Mn; less than 0.6% Si; less than 0.065 P; less than 0.020% S. A complete outline of a heat made in a 7-ton basic Heroult furnace, including nature of charge, heating cycle, slagging, addns., analyses of steel and slag is presented. A heat balance, based on H.'s previous article (*C. A.* **20**, 1564), is as follows: Steel 48.8%, slags 8.2%, cooling rings 2.9%, transformer 1.3%, radiation, etc., 38.8%. Bottom pouring is generally practiced so that quicker teeming and the production of sounder metal is possible. A. D. SPILLMAN

The charge of the electric furnace. K. VON KERPELY. *Giesserei* **15**, 225–9(1928).—A brief discussion of the influence of the size and shape of steel scrap on the charging and current consumption of the elec. furnace. The advantages and disadvantages

of acid- and basic-lined elec. furnaces are discussed. The prepn. of various types of steel is discussed. J. Balozian

Electric furnaces for melting metals and alloys. Karl Kalman. *Zentr. Hütten- u. Walzwerke* **31,** 347–51; *Chem. Zentr.* **1927,** II, 1074.—A review of the advantages of elec. furnaces in the industries with particular reference to high-frequency furnaces. J. S. Reichert

The energy losses in the electric arc steel furnace. St. Kris. *Arch. Eisenhüttenwesen* **1,** 413–9(1927).—The distribution of the energy losses in an elec. steel furnace is detd. partly from investigations on a plant scale, and partly from the results of Keil and Hess (*Stahl u. Eisen* **45,** 1134–46(1925)) and Lyche and Neuhauss (*Ber. Stahlw.-Aussch. V. Eisenh.* No. 101(1926)). They are divided into: (1) elec losses (transformer, cable, electrode); (2) losses due to the conduction and radiation of heat; (3) losses due to escaping gases. The transformer losses, consisting of Fe (hysteresis and eddy current) and Cu (ohmic resistance of the windings), are for a 5-ton furnace equal to 3.3% of the total input. Those losses in the line from the transformer to the furnace, consisting of Cu, inductive and electrode (outside the furnace) losses, are 6% The energy lost in heating the cooling H_2O is 4.1%. The losses due to the conduction and radiation from the furnace, calcd. from measurements of temps. at various points on its exterior walls, are 15.2%. The heat lost through opening of, or cracks in, the doors, etc., increases as the 4th power of the temp. of the radiating surface, and amounts to 6.6% of the total energy input. The loss of energy in the gases developed during refining and deoxidation, and by the formation of CaC_2 and the consumption of the electrodes due to air sucked in through electrode openings, is 4.3%. The total calcd. energy input, using the above figures and allowing for the energy consumed during the melting, is in agreement with actual furnace performance. J. Balozian

Large capacity vacuum electric resistance furnace for the preparation of experimental alloys. Pure magnesia crucibles for very high temperatures. G. Chaudron and M. Garvin. École nationale supérieure des mines. *Chimie et industrie* Special No., 386–7(April, 1928); cf. *C. A.* **17,** 2374; **21,** 514.—An illustrated description is given of a furnace of larger capacity, in which can be melted 400–500 g. Fe, or 400 g. Pt using only half the capacity of the crucible. In order to obtain malleable Pt the MgO crucible must be lined with a very thin coating of CaO; fusion is obtained in 15 min. with a power input of about 10 kw. Crucibles of pure MgO withstand the highest temps. of this furnace (2600°) and are not very sensitive to sudden changes of temp. Even when full of molten Pt they can be withdrawn directly from the furnace into the atm.; but they do not stand the oxy-H blowpipe because it does not heat them uniformly. A. Papineau-Couture

A valve-maintained high-frequency induction furnace and some notes on the performance of induction furnaces. A. Eric Bell. *Proc. Phys. Soc. London* **40,** 193–205(1928).—The elec. design of a valve-operated, high-frequency furnace capable of meeting the varied demands of a research lab. is described. The frequency and other consts. can be varied over a wide range. A 12–15-kv.-a. unit for this purpose is described in detail, together with its operation and performance. Exptl. results on the performance of high frequency furnaces including energy supplied as heat to the charge and that lost by heating the inductor are presented. A. D. Spillman

An electric crucible furnace with air circulation. G. H. Abels and E. M. Titov. *Ann. inst. polytech. Oural* **6,** 351–3(1927).—An elec. furnace for ignition and fusing is described. The furnace is built in the shape of a vertical cylinder 5 × 5 cm., has a double cover and bottom in which channels for circulation of air are arranged. The channel in the bottom is adjustable for the regulation of the air stream. G. B. K.

The development of the electrode industry. Gustav Schuchardt. *Zentr. Hütten- u. Walzwerke* **31,** 597–9; *Chem. Zentr.* **1927,** II, 2775.—A review of progress in the production of *carbon steel* and *Al* electrodes. C. C. Davis

High-efficiency motor-generator sets for electrolyzing leaching-plant solution. David Hall. Am. Inst. Min. Metall. Eng., *Techn. Publ.* No. **132** (Sept., 1928).—The installation of the Inspiration Copper Co., Arizona, is briefly described. Motor generators are used. At full loads the losses are less than 8%. The av. current and voltage requirements during 1927 were approx. 32,000 amp. at 300 v., supplying current to 120 electrolytic cells, each contg. 85 Pb anodes and 84 cathodes, and 14 cells in which the Cu starting sheets were made. C. G. F.

Studies in electroplating. Electrodeposition on aluminum. III. The non-adhesion of electrodeposits. W. E. Hughes. *Metal Ind.* (London) **33,** 173–6(1928).—A historical discussion of non-adhesion covers minutely its causes, which are enumerated and classified. Numerous references are made to the literature. W. H. Boynton

Health hazards in chromium plating. J. J. Bloomfield and William Blum. U. S. Pub. Health Service. *Pub. Health Repts.* **43**, 2330–51(1928).—Air analyses and medical examns. indicate that continuous daily exposure to a concn. of CrO_3 greater than 1 mg. in 10 cu. m. is likely to cause definite injury to the nasal tissues of the operators. The most efficient method of ventilation is to draw the air laterally across the top of the plating tanks into ducts 1 to 2 inches wide and extending fully along one or more sides of the tank. Tanks wider than 18 inches should have ducts on both sides, or else two ducts in the center, the air velocity at the duct being about 2000 ft. per min. The level of the plating soln. should be at least 8 inches below the top of the tank and the duct should be at the top of the tank. Injury by the CrO_3 solns. and mist can be decreased by frequent washing in dil. Na. thiosulfate, or bisulfite, or NH_4 polysulfide; and by application of vaseline, lanolin or mentholatum salve. C. M. Salls

Electrodeposition of metallic alloys from aqueous solutions of binary electrolytes. I. Copper-cadmium alloy. N. N. Efremov. *Ann. inst. polytechn. Oural* **6**, 111–50 (1927).—E. has investigated the effect of varying conditions, such as the compn. of the electrolytic bath and of the anode and cathode materials, the c. d. and the temp. on the electrodeposition of Cu-Cd alloys. Expts. show that only with complex salts such as cyanides a simultaneous deposit of both metals obtains. The electrode potential of Cu was found to be higher than that of Cd in solns. of cyanides except when the concn. of KCN was kept below 0.3 *N*. Correspondingly only from these latter soln. can an alloy be obtained, deposits of Cd only resulting otherwise. This is due to the fact that Cd does not have a depolarizing action on the cathode as does Cu in Cu-Zn soln. The ratio Cu: Cd in soln. is the main factor affecting the compn. of the alloy. However, the product obtained under seemingly identical conditions varies considerably in compn. Thus, with the 1:1 wt. ratio of Cd:Cu, alloys contg. from 64 to 72% Cd were obtained. The compn. of the anode does not influence the deposition materially and the Cu-Cd anodes dissolve only slowly in the cyanide soln. studied. Temp has little influence on the compn. of the product. The current efficiency is also almost independent from temp. (17–60°) but is influenced by the c. d. While higher c. d. promotes efficiency, the most advantageous current is 40–60 amp. per sq. m. since it yields the best deposits combining them with high efficiency (88–90%). The Cu-Cd alloys obtained form well-adhering deposits on Pt, Cu, Cd, Fe, Pb, Al, Au and other metals. E. points out furthermore that according to his observations such exothermic compds. as Cd_3Cu_2 and $CdCu_3$, when present in the anode, are very easily decompd. by the electrolysis. G. B. K.

The influence of p_H in the electrolytic deposition of copper in the presence of gelatin. C. Marie and M. L. Claudel. *Compt. rend.* **187**, 170–1(1928).—When depositing Cu from a soln. of $CuSO_4$ contg. gelatin, the max. surcharge is obtained at p_H 3.5 and the min. is obtained at the isoelec. point, p_H 4.7. E. G. Vanden Bosche

A new rapid galvanizing process and the present galvanization in static, acid electrolytes. H. Paweck and J. Seihser. *Zentr. Hütten- u. Walzwerke* **31**, 305–10, 322–5; *Chem. Zentr.* **1927**, II, 737.—An extensive study was made in an attempt to shorten the time required by the galvanizing process. A more rapid process was based on the use of a circulating electrolyte in which a Zn coating of 100 g./sq. m. can be put on with 5–6 v., 5000 amps./sq. m., and an 80% current efficiency in $1^1/_2$ min. The baths consisted of $ZnSO_4$ or $ZnCl_2$ solns. (8–12%), to part of which H_3BO_3 was added. J. S. Reichert

Application of electrolytic zinc process to Tri-States ores. H. R. Hanley. *Bull. Am. Zinc Inst.* **11**, 136–44(1928).—Advancement in the electrolytic Zn industry runs parallel with the improvements made in selective flotation. The demand of high-grade concentrate by the electrolytic plant is due to the resultant lower Fe, and to the lower wt. of leached residue. The factors associated with the continuity of flow of materials through the plant are: purification of soln, the maintenance of this purity, and coördinated organization. Characteristics of Tri-States' (Joplin) concentrates may be summarized as: (1) Zn in the calcine is 97–8% sol. in dil. H_2SO_4; (2) only a trace of Fe is present, necessitating addns if As or Sb develop by repeated cycles; (3) the settling of the neutral pulp and the filtration of the acid mud are reasonably satisfactory; (4) the complete sepn. of Cd is a matter of standard practice; and (5) Co can be economically taken care of if it reaches unexpected proportions. A general plant procedure is outlined. W. H. Boynton

Cadmium as a by-product of the zinc industry. M. Altmayer. *J. four élec.* **37**, 237–8(1928).—If the Cu-Cd-Zn ppt. is As-free the steps in the process are as follows: (1) leaching with dil. H_2SO_4; (2) separation of the high-Cu residue from the soln. contg. the Cd and Zn; (3) pptn. of sponge Cd; (4) dissolving the Cd sponge in hot dil. H_2SO_4

(electrolyte); (5) elimination of Fe; (6) elimination of Tl; (7) cathodic deposition of Cd. For step (1) H_2SO_4 soln. contains 250 g./l. at 60°. The excess acid is neutralized with lime and black Cu oxide is pptd. C. G. F.

The manufacture of aluminum. H. BACH. *Zentr. Hutten- u. Walzwerke* **31**, 289–93, 354–7; *Chem. Zentr.* **1927**, II, 1075.—The new plants of the Aluminum Co. of Canada at Aroida are described. J. S. REICHERT

Cryolite. ANON. *Mineral Ind.* **36**, 202(1927).—Statistics of production and trade are given. A B.

The electrolytic preparation of cuprous oxide. E. ABEL AND O. REDLICH. *Z. Elektrochem.* **34**, 323–6(1928).—A study of the effect of electrolyte, electrode material, c. d. and temp. on the efficiency of production of Cu_2O and the nature of the product obtained. The relative speeds of the various possible ionic reactions, and the reversible e. m. fs. corresponding to them are discussed. The best condition for the electrolytic production of Cu_2O are found to be: slightly alk. soln. of NaCl (110 g. NaCl and 1.2 g. NaOH per l.) as electrolyte; electrodes of electrolytic Cu so arranged that the oxide which scales off will not remain in contact with the electrodes; a c. d. of 0.5 to 1.0 amp./sq. dm. and reversal of current every 45 min. W. J. SWEENEY

Direct electrolytic preparation of potassium permanganate. GASTON RAPIN. *Compt. rend.* **187**, 112–4(1928).—The direct electrolytic prepn. of $KMnO_4$ consists of electrolyzing an aq. soln. of KOH or other K salt with a manganese-alloy anode. A relatively pure product is made in a one-step process, requiring little labor, and avoiding corrosion of the reaction vessel. Disadvantages are low current efficiency, high energy consumption and rapid covering of the generally used ferro-manganese anode by an adherent insulating coat of Fe and Mn oxides. Powdered ferro-Mn anodes will not yield $KMnO_4$ probably because of catalytic effects. R. improves the process by using cast silico-manganese (Si 33%, Mn 66%), which corrodes uniformly. With KOH both $KMnO_4$ and K_2MnO_4 are formed. The concn. of the latter becomes const. $KMnO_4$ crystals, mixed with pulverulent unattacked silico Mn and Fe and Mn oxides, collect on the bottom of the cell. Si remains in soln. as K_2SiO_3. With K_2CO_3 only $KMnO_4$ is formed, and Si is pptd. as SiO_2. Other conditions being the same, higher yields are obtained with KOH. High temp. (60°) gives higher $KMnO_4$ yield, better current and energy efficiencies, and faster anodic corrosion. KOH concn. should be about 6*N*; higher concn. results in increased voltage and slower corrosion. 50° Bé. soln. yields only K_2MnO_4. B. MILLER

Carbonates in silver (cyanide) solution. GEORGE B. HOGABOOM. *Metal Ind.* (London) **32**, 401–2(1928).—Exptl. work on the effect of K_2CO_3 in Ag plating solns. confirm the opinion of American platers that carbonates are detrimental. Both anode and cathode efficiencies are affected, thereby affecting their polarization, anode corrosion, soln. maintenance, cathode structure and applied voltage. It is doubtful whether the improved cond. afforded by high carbonates is sufficient justification for their use in concn. materially affecting the above-mentioned factors. W. H. BOYNTON

The electrolytic oxidation of aniline. JAROMIL SLÁDEK. Charles Univ., Prague. *Časopis Československého Lékárnictva* **7**, 299–312(1927).—The best conditions for the formation of quinone by the electrolytic oxidation of aniline are (1) the use of V_2O_5, which is the best catalyst, (2) continuous oxidation, (3) a high anodic surface relative to the quantity of anolyte, (4) a current density of 1 amp./sq. dm. (5) a temp. below 10°. WILLIAM J. HUSA

Cathodo-luminescence and the luminescence of incandescent solids. E. L. NICHOLS, H. L. HOWES AND D. T. WILBER. *Carnegie Inst. Washington Pub.* **384**, viii + 350 pp.(1928).—"It has been the purpose of this treatise, and particularly of this final chapter, to bring together the accumulating evidence connecting the luminescence of incandescent bodies with the fluorescence of solids at ordinary temps. We think, in view of the facts here presented, that the luminescence superimposed upon the incandescence of the various solids is simply a *fluorescence* in all essentials identical with that commonly excited by light, cathode rays, and other familiar agencies." JOSEPH S. HEPBURN

Overpotential at metallic cathodes. Cadmium and antimony in neutral and alkaline solutions. JULIUS GRANT. Sir John Cass Technical Institute. *Trans. Faraday Soc.* **24**, 367–70(1928); cf. *C. A.* **22**, 1105.—The results for these metals are in agreement with those for Ag. An attempt is made to explain the deviations from the linear *p*H-overvoltage relation. B. MILLER

Studies on overvoltage. IV. The measurement of minimum overvoltage from the current-voltage curves. TADASHI ONODA. *Z. anorg. allgem. Chem.* **172**, 87–108 (1928).—The H overvoltage on Au, Pt, Cu, Ni and Hg are detd. from the current-volt-

age curves. As in the bubble method, the overvoltage changes with the surface condition and previous treatment of the metal. The min. overvoltage, as detd. by the current-voltage method, shows approx. agreement with that detd. by the bubble method. Mean values for min. H overvoltage in $2N$ H_2SO_4 at 30° are: Pt 0.00061, Au 0.0084, Ni 0.084, Cu 0.091 v. **V. The relation between minimum overvoltage and current density.** *Ibid* 109–20.—Detns. were made on the O overvoltage of Au electrodes with change in the c. d. A min. overvoltage dependent on the quantity of electricity used for the anodic polarization appeared. The relation between min. overvoltage and c. d. is well represented by the equation $E_m = E_0I^b$, where b is a const. dependent on the metal of the electrode, and I equals the c. d. in milliamps. per sq. cm. Expts. were carried out which tend to prove that the overvoltage is not affected by an oxide film.

W. J. Sweeney

Modifications of the Sand auxiliary electrode. Thomas B. Smith. *Trans. Faraday Soc.* **24,** 216–25(1928).—"The value of the Sand electrode is generally recognized for accurately controlling the potential drop at the cathode during sepns. of metals, the O_2 potentials of which are very close to one another or to that of H_2." Several modifications are described and illus. Expts. indicate that with the aid of connecting liquids of high conductance, the resistance of the auxiliary electrode circuit can be reduced sufficiently to permit the use of an instrument of moderate sensitivity, provided that the potential of the auxiliary cell remains const. under the working conditions. Substitution of a porous diaphragm instead of the special tap of the Sand electrode, and a modification of the design of the tube result in reduction of the working resistance of the auxiliary electrode to about $^1/_{10}$ of the usual, enabling the potentiometer voltmeter to function also as a null-point detector without causing appreciable error on account of concn. polarization of the half-cells. This type may be used for some time without refilling with electrolyte. The employment of a voltmeter for detection of the null point is more convenient and more economical than the use of a capillary electrometer. The modification using connecting liquids of higher cond. than usual is conveniently employed as a quinhydrone electrode in the control of Bi estns. • Arrangements are described for utilizing, and where necessary, modifying panel-mounting radio app. so as to permit of the enclosure of the parts most vulnerable to attack by acid fumes.

W. H. Boynton

High-voltage (lead) storage battery. L. E. Dickinson. *Bell Labs. Record* **5,** 163–5(1928).—The storage battery furnishes the best source of d. c. of several hundred amps. at high potential for the development of fuses, protector blocks and other pieces of protective app. for telephone use. The battery described has 2112 cells, each of 60 amp-hrs. capacity, permanently connected together into groups of 44, which may be connected together as wanted. The cell groups are mounted in series or in parallel by knife switches. Any voltage between 90 and 4320 can be obtained in steps of 90 v. Other switch panels provide for battery connection to start and stop testing, and for charging. Four illustrations are given.

W. H. Boynton

Instruction on the making of potassium hydride photoelectric cells. Wayne B. Nottingham. Bartol Foundation. *J. Franklin Institute* **205,** 637–48(1928).—Detailed instructions for prepg. this type of cell are given. The mech. construction, prepn. of the K metal, purification of the A, production of the H_2, baking out and distn., circuits for measuring the photoelec. current, formation of the hydride, and detn. of the crit. voltage are discussed.

W. T. Richards

The lead acid cell. Harold G. Brown. *J. Royal Soc. Arts* No. **3939,** 675–710 (1928).—This discussion of the Pb acid cell and its place in modern industry is very comprehensive and is divided into 3 parts. (1) deals with historical development and the tech. and theoretical aspects of the cell since its inception by Planté in 1859. Features of both Planté and Faure types Pb cells are included. Comparative weights are: for Planté 3.1–3.75 w.-hr. per lb. of cell; for Faure 9–10–12 w.-hr. per lb. of cell. (2) is devoted to the use of a Pb acid cell as a power unit in central stations. During peak loads the batteries discharge while during the valleys of station loads the batteries are charged. (3) deals with modern developments and the use of Pb acid cells in telephone exchanges, railway work for automatic signaling, submarines and for traction. Comparative figures for Pb storage batteries and Fe-Ni (Edison-Jungner) batteries are given which will assist in selecting the most suitable type for a given kind of duty. It is concluded that the Pb acid cell will be the principal means of storing elec. energy for years to come.

A. D. Spillman

How electricity produces commercially pure acids. C. M. Hoff. *Chem. Met. Eng.* **35,** 419–20 (1928).—See *C. A.* **22,** 1732.

C. J. Brockman

Characteristics of photoelectric tubes (cesium). L. R. Koller and H. A. Breed-

ING. *Gen. Elec. Rev.* 31, 476(1928).—The most useful property of the photoelec. tube is the definite relation that exists between the intensity of light falling upon the tube and the amount of current that a const. voltage will force through the tube. For special types of construction and operation the relation is linear. The tubes described are spherical glass bulbs with silvered inside surface upon which a monatomic film of Cs is deposited, the Cs and Ag serving as cathode. The anode is a pair of wires projecting into the bulb to its center. Two of the tubes were 2.5 in. in diam. with a 1.5-in. window. The anode leads carried at their tip a Ni disk $^1/_8$ in. in diam. Both high vacuum and A-filled (0.02 to 0.04 mm. Hg pressure) tubes were investigated. The tubes were photometered and numerous charts are given. The photoelec. current is almost directly proportional to the illumination intensity in foot-candles. Upon increasing the A pressure in the tube (at a fixed voltage) from zero upwards the sensitivity increases rapidly, reaches a sharp max. (at about 0.2 mm. Hg) and then drops off rapidly again until at about 0.5 mm. the sensitivity begins to drop off gradually. With varying voltage the max. sensitivity is obtained at about 0.075 mm. A. The pressure giving the highest sensitivity is not always the most desirable on account of the instability of the tube. C. G. F.

Metallic precipitates under the microscope. M. ZWÖLFMEYER. *Blätter Unters. Forsch. Instr.* 1, 53-6; *Chem. Zentr.* 1927, II, 2709.—By means of pictures of polished surfaces investigations of materials used heretofore as anodes in nickel baths, *i. e.*, cast, rolled and elec. pptd. anodes, and ppts. on various metals in galvanic baths, are described and illustrated and the importance of such investigations in relation to these industrial applications is discussed. C. C. DAVIS

(Cottrell) precipitation in Europe. G. BERG. *Elec. World* 92, 499-503(1928); 8 illus.—A review. There are about 2000 plants now in operation. C. G. F.

Cottrell electrostatic dust recovery apparatus at the "Krasni Vyborgets" plant. A. A. BAIMAKOV AND A. A. BOULAK. *Rev. soc. russe métal.* No. 1, 165-76 (1927); *Rev. métal.* 25(Extraits), 348(1928).—A description of the installation. In cold weather the gases are sufficiently moist to effect recovery of the ZnO dust produced in the recovery of Cu from brass; but in warm weather steam is injected into the app. A. PAPINEAU-COUTURE

Thin-film rectifiers. J. SLEPIAN. *Trans. Am. Electrochem. Soc.* 54 (preprint), 30 pp., 19 illus.—An exhaustive review of the principle underlying the operation of thermionic rectifiers and application to a theory of thin-film rectifiers. This theory is applied to other types of rectifiers including crystal detectors, Ta and ferro-Si rectifiers, electrolytic rectifiers with metallic conduction, the Cu hemi-sulfide rectifier of Pawlowski, and the Cu oxide rectifier of Gorndahl. In all cases it is assumed that a thin film is insulating in itself due to lack of free electrons or ions, rather than to any enormous opposition to the motion of electrons or ions. If a sufficiently high voltage is applied the electrons emitted from the cathode may cause elec. breakdown of the film, that is, the development in it of free electrode or ions. C. G. F.

Results obtained with aluminum transmission lines. H. SCHMITT. *Z. Metallkunde* 20, 305-8(1928).—A discussion of the replies to a questionnaire regarding the success obtained with Al and steel-Al elec. transmission lines in Germany. A diminishingly small no. of Al conductors had to be replaced, and principally because of insufficient purity of the metal. Where the purity of the Al used is above 99%, good results have usually been obtained. In general the highest stress allowed is 8 kg./sq. mm. Neither proximity to factories and mines nor the occurrence of frost and ice harms otherwise satisfactory Al conductors. Only 2 companies gave a generally unfavorable opinion. Eighteen companies, representing about 50% of the total wire length covered by the questionnaire, reported merely on the magnitude and type of any defects encountered, without giving any general opinion. Ten companies, representing 40% of the total wire length, either gave an unqualified favorable opinion or failed to indicate any defects. H. STOERTZ

Residual thermoelectricity of a mercury filament. TOSHIMASA TSUTSUI. *Proc. Imp. Acad. Tokyo* 4, 279-82(1928).—The effects of the geometrical cross-section and of the thin surface layer of a filament on its residual thermoelectricity were studied. The Hg was placed in a long capillary tube of which a portion was heated. The thermoelectric effect was measured for different sections heated. A constriction in the tube caused the Hg within it to behave quite differently from that in the main capillary, a distinct e. m. f. being noticed at the junction. The contact between the glass and Hg appears to have an important but undetd. influence. The conclusions are: The observed e. m. f. is not due to internal structure as in metallic wires; geometrical form of the cross-section is without effect in the case of Hg, within the accuracy of these expts.;

Hg contained in a small tube inserted in a larger tube behaves like a different material toward Hg in the larger tube; the seat of the e. m. f. is unstable. The smaller the diam. the greater the instability. R. L. HERSHEY

Central-station use of pulverized coal (TENNEY) 21. Electrolysis of sugar juices (BERGE) 28. The electric micro-combustion furnace of Heraeus (FLASCHENTRÄGER) 1. The method of current density-voltage measurement (DADIEU) 2. Tests of mechanical and electrical precipitation of tar (SEIDENSCHNUR, GROTH) 21. Electrodeposition of rubber, etc. (Brit. pat. 284,736) 30. Electrical insulation (Brit. pat. 284,232) 13. Alloy for use in magnetic circuits of multiplier devices for high-frequency currents or other electrical devices (U. S. pat. 1,687,298) 9. Briquetting ores, etc. [electrodes] (Brit. pat. 284,418) 13. Electrodes and other articles formed of C (Brit. pat. 284,818) 18. Electrically heated kiln suitable for burning limestone (U. S. pat. 1,687,025) 18. Porous artificial stone [for use in storage batteries] (Brit. pat. 285,470) 20.

Electric batteries (suitable for use with flash lamps). C. GAISER. Brit. 284,626, Feb. 1, 1927. Structural features.

Dry-cell electric battery. HOWARD D. HODGE (to Burgess Battery Co.). U. S. 1,684,735, Sept. 18. Structural features.

Electric battery of the Leclanche type. GEORGE N. ANTONOFF (to Matthew A. Adam). U. S. 1,687,051, Oct. 9. A cell with an outer moisture-retaining case which may be formed of paraffined cardboard provides free ventilation for the Zn electrode both externally and internally and has a firm gelatinous electrolyte which may be formed from tapioca and NH_4Cl.

Galvanic cell. M. M. POPOV-PLATONOV. Russ. 3754, Oct. 31, 1927. A Zn-C cell is characterized by a depolarizer pressed from wood charcoal previously satd. with O_2 or O_3 with or without the addition of $CaOCl_2$.

Prevention of corrosion on galvanic cell terminals. B. V. SIZAREV. Russ. 3780, Oct 31, 1927. The electrolyte is covered by a mixture of 85% oil drier, 10% drying oil and 5% petrolatum.

Storage battery. M. ESPAGNENT. Brit. 285,501, Feb. 18, 1927. Structural features.

Storage battery. CHARLES J. V. FÉRY. U. S. 1,685,695, Sept. 25. See Brit. 275,750 (*C. A.* **22,** 2330).

Storage batteries. CHARLES J. V. FÉRY. Fr. 32,646, Apr. 26, 1926. Addn. to 611,129. A layer of heavy oil above the electrolyte protects the negative plates from oxidation.

Storage battery. OLDHAM & SON, LTD. AND H. E. CLARKE. Brit. 284,953, Nov. 3, 1926. Structural features.

Storage battery. D. P. BATTERY CO., LTD., J. WADDELL and B. M. DRAKE. Brit 285,226, Jan. 18, 1927 Separators of glass wool felt are used together with other separators which may be formed of wood, ebonite or perforated celluloid.

Storage battery. I. G. FARBENIND. A.-G. Brit. 284,352, Jan. 28, 1927. Pb grids of storage battery plates are provided with openings which are filled with an alloy of Pb and Na. Structural features and a method of making the plates are specified.

Storage battery. I. G. FARBENIND. A.-G. Brit. 285,354, Feb. 12, 1927. Pb skeleton grids are coated with a protective coating such as an oxide, sulfide or sulfate of Pb (suitably by dipping the skeleton, with or without previous oxidation, into H_2SO_4 or a sulfide soln.) to prevent it from being attacked by metal alloyed with the Pb which is poured into the grid, in making electrodes as described in Brit. 284,352 (cf. preceding abstract). The coating also serves as a heat insulator.

Storage battery. ALFRED P. WOOD (a 0.49 interest to Francis L. Murray). U. S. 1,687,416, Oct. 9. Structural features.

Storage battery with an opaque casing and a transparent window to show the electrolyte level. G. H. TROTTER. Brit. 285,293, May 24, 1927. Structural features.

Electrolyte for storage batteries. A. B. WERBY (to American Automotive Corp.). U. S. 1,684,842, Sept. 18. An electrolyte is formed of H_2SO_4 and water, together with NH_4 acetate which serves to prevent sulfation. Sulfates of K, Mg and Na also may be used.

Composition for use in storage batteries. PATRICK J. KELLEHER. U. S. 1,685,674, Sept 25. A compn. for preventing sulfation of storage batteries comprises $MgSO_4$ 84, $(NH_4)_2SO_4$ 3, K_2SO_4 6 and $Al_2(SO_4)_3$ 7%. Cf. *C. A.* **21,** 861.

Charge indicator for storage batteries. W. R. PENROSE. Brit. 285,286, July 7, 1927. When the battery is fully charged, gases evolved force indicator liquid up the

longer limb of a bent tube and bubble through the liquid. The device may be mounted on the instrument board of an automobile.

Storage-battery plate. JASPER N. DAVIS. U. S. 1,685,215, Sept. 25. Structural features.

Wood pulp storage battery separators with ebonite ribs. C. N. WATERS. Brit. 284,853, Jan. 20, 1927.

Hydrometer for suspension from vent plugs of storage batteries. C. E. LINEBARGER. Brit. 284,916, May 27, 1927.

Electrodes for electric batteries, etc. RENE OPPENHEIM (to Soc. anon. le carbone). U. S. 1,687,307, Oct. 9. Electrodes for batteries, accumulators and electrolytic app. comprise a mixt. of granular active material such as Pb oxide compn. and another granular material such as silica gel which is permeable to gases and substantially impermeable to liquids. Cf. *C. A.* **21**, 2438.

Carbon electrodes for electric batteries. COMPAGNIE LORRAINE DE CHARBONS, LAMPES, ET APPAREILLAGES ELECTRIQUES. Brit. 285,415, Feb. 16, 1927. C electrodes are provided with discontinuous hollows or sinuous grooves to prevent sepn. of surrounding depolarizing material.

Selenium cells. J. NEALE. Brit. 284,942, Aug. 6, 1927. In making cells of the type in which cond. electrodes, preferably in the form of interdigitated combs or grids, are formed on an insulating base and coated with Se, the electrodes are formed so that they are relatively immovable by the method of "fusing-in" by which Au, Ag or Pt or all 3 metals are applied as in coating earthenware or china. Various details are given.

Gas cell. HENRI SPINDLER. Fr. 635,633, June 8, 1927. A gas cell working under very high pressures, *e. g.*, several hundred atms. is described. The electrolyte used may be KOH or a complex chloronitrate of Cu-Co made by adding HNO_3 to a mixt. of chlorides of Cu and Co.

Photoelectric cell for reproducing sound from a photographic record, etc. L. DE FOREST (to De Forest Phonofilms, Ltd.). Brit. 284,342, Jan. 29, 1927. Structural features.

Electric apparatus for various purposes, utilizing photoelectric cells. NEUFELDT & KUHNKE BETRIEBSGES. Brit. 285,062, Feb. 10, 1927.

Electrolytic rectifier. WM. C. READ (to Electro Metallurgical Co.). U. S. 1,684,684, Sept. 18. An electrolyte of 10-40% H_2SO_4 soln. contg. a metal sulfate such as $FeSO_4$ is used with a cathode contg. Si and Ti or like metal and an anode which may be formed of Pb or a Pb alloy.

Cellular accumulator. JEAN-MARIE LARGE. Fr. 635,600, June 7, 1927. Constructional details.

Treatment of glass in the electric arc. EMIL EDWIN (to Aktieselskapet Norsk Staal Elektrisk-Gas-Reduktion). Can. 283,385, Sept. 18, 1928. A cold electrode is located in the upper end of an upright flame tube, the lower end of which communicates with a molten bath of heat-resisting material forming a hot electrode. The gases to be treated enter the upper part of the flame tube and after passing through the high-tension elec. arc are discharged above the surface of the bath.

Electrodeposition of zinc from its sulfate solutions. I. G. FARBENIND. A. G. Brit. 285,373, Feb. 14, 1927. A $ZnSO_4$ soln. preferably contg. 15-25% free acid is electrolyzed at a low c. d. (suitably 200-500 amp. per sq. meter). With an electrolyte of this character improved extn. by lixiviation of zinciferous material is attained.

Apparatus for cleaning electroplate goods by heating. ANTON MAREK. Austrian 109,156, Nov. 15, 1927. Constructional details.

Electrolytic baths. ALLEN ELECTROLYTIC CELL CORPORATION. Fr. 635,192, June 3, 1927. Constructional features.

Purifying brine for electrolytic processes. JULIUS DRUCKER (to I. G. Farbenind. A.-G.). U. S. 1,687,433, Oct. 9. An alkali metal fluoride is added to ppt. Mg and Ca as fluorides.

Tank for chromium baths. CHROM INDUSTRIE MAX WOMMER. Fr. 635,699, June 9, 1927. A tank is formed with a hollow rim with holes opening into the tank through which the mist forming on the bath is drawn by suction.

Electrodeposition of chromium. W. S. EATON. Brit. 284,900, May 2, 1927. Cr is deposited from a bath contg. chromic acid and an alk. content mainly formed of NaOH. An alk. mixt. for addn. to the bath may, *e. g.*, be suitably formed of NaOH 94, Na_2SO_4 2, Na_2CO_3 2 and NaCl and impurities 2%. One oz. of this mixt. may be used with chromic acid crystals 1 lb. and water 1 gal. in forming the electrolyte. Before plating, the cathode is cleaned in an alk. bath while connected to a C plate, graphite rod or to Fe to form a couple. It is then rinsed and placed while wet in the plating

bath. A temp. of about 45–55°, voltage of 5–10 and c. d. of 1–2 amp. per sq. in. are suitable for the plating operation.

Electrolytic preparation of chromium. CHROM INDUSTRIE MAX WOMMER. Fr. 635,700, June 9, 1927. To the solns. of chromic acid or chromates, solubilized inorg. colloids are added to obtain pure adherent and homogeneous ppts. of Cr.

Chromium. GENERAL ELECTRIC CO., LTD., AND C. J. SMITHELLS. Brit. 285,571, Nov. 18, 1926. To form coherent bodies of Cr, the powd. material is pressed into bars and sintered in H at a temp. of 1500–1550°. The Cr powder may be prepd. by passing an elec. current of about 140 amp. per sq. decimeter through a soln. contg. 24.5% chromic acid and 0.3% chromic sulfate, using an anode of Pb and a cathode of Cu or Al, while the soln. is at a temp. of about 50°. The powder is washed and dried and heated at 1300° in H to reduce any oxide present. The H used may be purified by passing it over incandescent W and through a tube cooled in liquid O, and may be previously passed over Cu heated to redness and P_2O_5.

Aluminum. SOCIÉTÉ ANON. POUR L'IND. DE L'ALUMINUM. Fr. 635,541, June 4, 1927. Pure Al is obtained from crude Al or its alloys by electrolysis in a bath contg. Al halides and alkali and (or) alk earth halides, the Al salt being in excess. The process may be carried out in closed tanks under slight pressure.

Recovery of nickel and copper. CHEMISCHE FABRIK JOHANNISTHAL G.M.B.H. AND FRIEDRICH TROSTLER. Fr. 635,804, June 11, 1927. See Brit. 283,132 (*C. A.* **22,** 5817).

Electrolytic separation of silver from alloys. RUDOLF CARL. U. S. 1,687,056, Oct. 9. Alloys of Ag with other metals such as Au, Zn and Cu are treated as anode in aq $NaClO_4$ soln. or other suitable neutral electrolyte, the anion of which is capable of forming with the Ag and base metal of the alloy easily sol. salts, so that hydroxyl ions are released at the anode and form oxides of the precious metals present and hydroxides of the base metals; the H released at the cathode reduces the Ag oxide to a finely distributed Ag which does not adhere to the cathode.

Alkaline hypochlorites. FERNAND CHEVRIER. Fr. 635,654, Dec. 21, 1926. In the electrolytic prepn. of NaOCl a high anodic tension is employed so that ozone is also produced.

Magnesium and alkaline earth metals by electrolysis of molten chlorides. ALFRED JESSUP Fr. 32,645, Apr. 22, 1926. Addn. to 613,930. The C or graphite anode is replaced by an intermediate alloy of Mg. Cf. *C. A.* **22,** 1285

Lead sulfate. AMÉDÉE P. CASSOU. Fr. 635,134, May 30, 1927. $PbSO_4$ is prepd. by electrolyzing with Pb electrodes, at a temp. below 40°, an aq. soln. of H_2SO_4, contg. in soln. a catalyst which is either a Pb sulfide, or an alkali sulfide or a sol. or slightly sol Pb compd., or mixts. of these products.

Electrolysis of water. FRANZ LAWACZECK. Fr. 635,660, Apr. 12, 1927. The pairs of electrodes are arranged in tiers Other constructional details are described.

Electrolytic decomposition of salts. A. I. NOVIKOV. Russ. 3764, Oct. 31, 1927. An electrolytic bath subdivided by semipermeable partitions is used for the decompn. of salts into acid and caustic. Acid used for the anolyte has the anion which is different from that of the anion of the salt to be decompd. The salt is introduced into a compartment near the catholyte according to the amt electrolyzed.

Electrolytic rectifier. EDGAR W. ENGLE (to Fansteel Products Co.). U. S. 1,686,316, Oct. 2. Electrodes of Rh and Ta are used with an electrolyte contg. H_2SO_4 and a small proportion of $FeSO_4$ or like salt. Cf. *C. A.* **22,** 3591.

Tinning. PIETRO MARTINELLI. Ital. 250,882, Oct. 15, 1925. Electrolytic bath for the galvanic tinning of metals.

Metal production in an electric furnace. EMIL G. T. GUSTAFSON (to Hampus G. E. Cornelius). Can. 283,819, Oct. 2, 1928. An elec. furnace is fettled and a quantity of slag, tapped from a previous heat, is introduced and held in a molten state until a sufficient quantity of charge for the next heat has been introduced, in order to protect the bottom of the furnace from the action of the elec. arc and to act as a distributor for the charge.

Electric furnace. CORNELIUS E. CORNELIUS. Can. 283,657, Oct. 2, 1928. An elec. furnace for melting and producing glass, water glass, cement, etc., is described.

Electric furnace. ELECTRIC FURNACE COMPANY. Fr. 635,966, June 14, 1927.

Electric furnaces. METALLWERK PLANSEE G.M.B.H. AND PAUL SCHWARZKOPF. Fr. 636,025, June 15, 1927. See Brit. 272,933 (*C. A.* **22,** 1737).

Electric furnaces. SOCIÉTÉ ÉLECTRO-MÉTALLURGIQUE DE MONTRICHER. Fr. 32,758, Dec. 21, 1926. Addn. to 608,835. Constructional improvements.

Small electric reheating furnace. JACQUES SCHMID. Fr. 636,032, June 15, 1927.

Electric induction furnace of the crucible type. CHARLES B. FOLEY (to Charles B. Foley, Inc.). U. S. 1,685,914, Oct. 2. The furnace is formed of 2 united blocks, each made in the form of a half crucible and formed of highly compressed refractory material.

Electric induction furnace of the submerged resistor type. EDWIN F. NORTHRUP (to Ajax Metal Co.). U. S. 1,684,504, Sept. 18.

Electric resistance furnace. H. WIGGIN & CO., LTD., AND A. G. LOBLEY. Brit. 285,147, Nov. 11, 1926. Resistance strips of Ni-Cr alloy may be suspended by hooks of the same material. Various other structural features also are specified.

Electric furnace (resistance heated, having a vertically movable hearth, and suitable for operating with an inert atmosphere). ALLGEMEINE ELEKTRICITÄTS-GES. (to International General Electric Co.). Brit. 284,350, Jan. 29, 1927. Structural features.

Electric furnace for producing silicon carbide. HAROLD E. WHITE (to Federal Abrasives Co.). U. S. 1,684,611, Sept. 18. A hearth is provided with concrete supports and the furnace also has concrete end walls free of any fixed connection with the hearth supports.

Electrolytic furnace. P. L. HULIN. Brit. 284,678, Feb. 3, 1927. Structural details are specified of a furnace adapted for electrolysis of chlorides or other compds of light metals such as Mg, Ca and Be.

Resistor support for electric furnaces. JOHANN SCHNEPF (to Westinghouse Elec. & Mfg. Co.). U. S. 1,686,037, Oct. 2. Structural features.

Electric heating units for metallurgical multiple hearth furnaces or similar apparatus. CHARLES L. BURDOCK (to Guggenheim Bros.). U. S. 1,685,226, Sept. 25. Structural features.

Apparatus for making self-baking electrodes for electric furnaces. MARTIN WALTHER (to Det Norske Aktieselskab for Elektrokemisk Industrie of Norway). U. S. 1,686,302, Oct. 2.

Self-baking electric furnace electrodes and holders and contacts for the electrodes. CARL W. SÖDERBERG (to Det Norske Aktieselskab for Elektrokemisk Industrie of Norway). U. S. 1,686,474, Oct. 2. Structural features.

Anodes. ERNST KELSEN. Fr. 635,771, June 10, 1927. Anodes for galvanization are made by compressing metal waste into the form of plates.

Heat-control system for electric ovens. JACOB L. SHROYER (to Edison Electric Appliance Co.). U. S. 1,685,647, Sept. 25.

"Cyanamide oven" for making blocks of calcium cyanamide and other materials. GEORGE E. COX (to American Cyanamide Co.). U. S. 1,684,758, Sept. 18.

Heat- or pressure-responsive device for controlling electric circuits. LESTER E. BECK. U. S. 1,685,211, Sept. 25.

Pressure-controlled device for electric switches, valves, etc. FRANK J. BAST (to Charles J. Tagliabue Mfg. Co.). U. S. 1,684,530, Sept. 18.

Electric recording device. W. C. SUTHERLAND and J. DENTON (to Keighley Dye Works). Brit. 285,114, Nov. 5, 1926.

Electric heater for liquids. ÖSTERREICHISCHE SIEMENS-SCHUCKERT-WERKE. Austrian 109,101, Nov. 15, 1927. Constructional details.

Apparatus for electrically heating liquids. GUSTAV BAUM (to Niagara Electro Chemical Co.). U. S. 1,685,210, Sept. 25. An app. is described which is suitable for use in distg., concg. or effecting reactions.

Electric heating of liquids for distillation, concentration, promoting reactions, etc. GUSTAV BAUM (to Niagara Electro Chemical Co., Inc.). U. S. 1,685,266, Sept. 25. H_2SO_4 to be purified or other liquid is absorbed in a porous non-cond. material and an elec. current is then passed through the absorbed liquid. An app. is described.

Protective cut-out device for oil-immersed electrical transformers, etc. T. A. E. BELT (to British Thomson-Houston Co., Ltd.). Brit. 284,630, Feb. 1, 1927. Gas evolved as a result of internal faults in the app. serves to displace oil in a tube and thus permit change in intensity of a beam of light passing to a photoelec. cell which in turn may operate an alarm or cut-out device.

Inert-gas protective casing for hydrogen-cooled dynamo-electric apparatus. FRANK D. NEWBURY (to Westinghouse Elec. & Mfg. Co.). U. S. 1,686,027, Oct. 2.

Electric system for effecting magnetic separations. B. GRANIGG. Brit. 284,307, Jan. 28, 1927.

Electric treatment of gaseous products evolved in carbonizing marine algae. G. J. B. CHAMAGNE. Brit. 284,583, Aug. 11, 1926. An elec. pptn. app. is described for recovery of pptd. and condensed substances from the gases produced in the carbonization. Cf. *C. A.* 22, 3501.

Electric filament device for consuming gases in cable tunnels, etc. HENRY C. P. WEBER (to Westinghouse Elec. & Mfg. Co.). U. S. 1,686,051, Oct. 2. A filament is used formed of material such as Ni capable of causing the combustion of sewer gas or other gaseous mixts. at temps. of 600–800° and this filament is secured to a base adapted to fit into an ordinary elec. lamp socket and is provided with a housing comprising a Davey safety lamp diaphragm which provides a combustion chamber for the filament.

Material for rectifying electric currents. WALTER O. SNELLING. U. S. 1,686,260, Oct. 2. Pressure is applied to pptd PbS or other similarly acting finely divided compd. of a metal with an element of the S group and the resulting coherent product is thereafter heated to a temp. sufficient to produce partial crystal growth, but lower than a sintering temp. A temp. of about 50–100° below its m. p. is suitable with PbS.

Hydrogenating hydrocarbons, etc. F. J. M. HANSEN. Brit. 284,655, Feb. 2, 1927. Hydrogenation of hydrocarbons such as $C_{10}H_8$, carbonaceous gases such as water gas or of C is effected by the action of an elec. arc or a series of elec. sparks from a condenser discharge between electrodes which are immersed in a solvent for the products which may be circulated in a closed circuit through either a cooling device or a still for recovery of certain of the products. H or material to be hydrogenated may be supplied through hollow electrodes and the electrodes or some of them may contain a hydrogenating catalyst such as Ni or a Ni compd. Coal or coke to be hydrogenated may be molded into electrodes with addn. of a metal salt or inclusion of a metal wire. The process may be carried out under about 10 atm. pressure.

Purifying solutions of aluminum salts. FRANCESCO GIORDANI (to Pomilio Bros. Corp.). U. S. 1,685,156, Sept. 25. Solns. of Al salts such as those obtained by acid treatment of leucite are freed from impurities such as Fe by electrolytic treatment, employing an Al electrode together with another electrode adapted to act as a positive electrode for a metal to be eliminated and which may suitably be formed of graphite for the elimination of Fe.

Liquid resistance. V. V. PLOTNIKOV. Russ. 3621, Sept. 30, 1927. Water-cooled glass tubes are filled with an electrolyte soln. (NaCl). Through the fused upper and lower ends of these tubes wires connect one plate on the bottom and corresponding contacts on the top of the cooling container. The electrolyte in the tubes acts as resistance.

Arc lamp electrodes. COMPAGNIE LORRAINE DE CHARBONS POUR L'ELECTRICITE (formerly Compagnie Lorraine de charbons, lampes, et appareillages electriques). Brit 285,424, Feb 16, 1927. Mineral substances are incorporated with the C to permit a c. d in excess of 1 amp. per sq. mm. These substances may be used in a core or may be uniformly distributed throughout the electrode material and may comprise oxides, fluorides or oxy-fluorides of the rare earth metals, especially those of the Ce group, and small quantities of H_3BO_3 or refractory compds. of Ti, W, Zr and V may be added. Oxides of Ca, Mg, Be, Zr, Al and Th also may be used and may partially replace the rare earth compds. The added mineral substances may comprise 50–55% of the electrode material.

Electric incandescent lamps. PATENT-TREUHAND-GES. FÜR ELEKTRISCHE GLÜHLAMPEN (to General Electric Co., Ltd.). Brit. 284,203, Jan. 26, 1927. To facilitate accurate proportioning and subdivision of "gettering" material it is mixed with a binder such as nitrocellulose soln. and formed into ribbons, filaments or the like.

Electric incandescent lamps. PATENT-TREUHAND-GES. FÜR ELEKTRISCHE GLÜHLAMPEN (to General Electric Co., Ltd). Brit. 285,009, Feb. 8, 1927. The caps of the lamps are provided with a heat-resisting coating which protects them from oxidation and may be formed of waterglass, borax or Na-NH_4 phosphate. NH_4 bifluoride may be used as an etching liquid to remove the coating locally where it is desired to attach soldered connections to the coated caps.

5—PHOTOGRAPHY

C. E. K. MEES

The use of light-sensitive organic compounds in photography. A. SEYEWETZ. École de chimie industrielle, Lyon. *Chimie et industrie* 20, 216–20(1928).—A brief review. A. PAPINEAU-COUTURE

Photographic transfer papers. T. P. MIDDLETON. *Brit. J. Phot.* 75, 495–7, 512 3(1928).—Description of methods of prepn. of emulsion-coated photographic papers.

Details are given for making slow and fast emulsions. Two methods of ripening are described: (*a*) the "boiling," and (*b*) the NH_4OH method. App. for shredding and washing emulsions are illustrated and directions for their use given. A table of chem. equivs. for emulsion making and a bibliography are appended. G. E. MATTHEWS

Machine processing of photographic papers and films. F. WENTZEL. *Z. Ver. deut. Ing.* **72,** 1017–24(1928).—Well-illustrated description of various types of machines for processing papers and films on a commercial scale. Types of exposing, developing, washing and drying machines are described including the more complicated automatic app. combining several operations such as photostat and multiple postcard systems. C. E. MEULENDYKE

Photographic preparation of printing plates. K. SCHUCH. *Chem.-Ztg.* **52,** 485–6 (1928).—Practical details are given for the prepn. of printing plates using asphalt and dichromated gelatin, albumin and fish glue. W. CLARK

Developing properties of diphenylamine derivatives. A. LUMIÈRE, L. LUMIÈRE AND A. SEYEWETZ. *Sci. ind. phot.* **8,** 28–32(1928); *Chimie et industrie* **Special No.,** 496–500(April, 1928).—The authors conclude that: (1) Substitution of a phenyl group in an amino group of *p*-phenylenediamine or of *p*-aminophenol to form the *p*-amino or *p*-hydroxyl derivs. of diphenylamine does not destroy the developing properties but causes them to be diminished; (2) the introduction of amino or hydroxy groups in the substituted phenyl group increases the developing power of the compd ; (3) the developing properties of diphenylamine are destroyed when a phenyl group is substituted for O, S, or N in the *o*-position to the common amino group although the compd. formed would be "quinonizable." The substituted compds. are the leuco bases of the oxazines, thiazines and azines. L. E MUEHLER

Observation on the fogging action of desensitizers. M. MUDROVEIC. *Phot. Ind.* **26,** 782(1928) —Evidence points to the fact that desensitizers with a free amino group do not fog an emulsion while those that have substituted amines do fog emulsions Many explanations are mentioned M. suggests that the fogging is caused by the coagulation of the Ag amicrons, thus forming particles large enough to promote development. The inhibiting effect of other dyes present is explained by diln. C. E. MEULENDYKE

Optical sensitizing of silver halide emulsions. I. Adsorption of orthochrome T to silver bromide. S. E. SHEPPARD AND H. CROUCH. *J. Phys. Chem.* **32,** 751–62; *Phot. J.* **68,** 273–80; *Sci. ind. phot.* **8M,** 24–7, *et seq.*(1928).—The absorption spectra in the visible and ultra-violet of orthochrome T bromide have been measured in solvents and in H_2O at various p_H values. The adsorption of the dye to AgBr was measured by mixing the 2 in various concns. and then sepg. the phases The grain size frequency of the AgBr was known so the ratio of moles of dye per sq. cm. of surface of the grains could be calcd Langmuir's adsorption equation was the only one found to fit the exptl. detn. As to the sensitizing of the AgBr it is suggested that the dye is held to the AgBr ion and that the photodecompn. is of an explosive character, thus one dye mol. could sensitize many AgBr mols. H. CROUCH

The relation between the photoelectric and the photographic effect in silver bromide. L. W. BUTLER. Ia. State Col., Ames. *Proc. Iowa Acad. Sci.* **34,** 277(1927).—Toy, Edgerton and Vick (*C. A.* **21,** 1223) have recently shown that the photoelec. effect in AgBr is due to ultra-violet light of wave-length less than $\lambda = 280\ m\mu$. Since the photographic effect extends to $\lambda = 500\ m\mu$ they concluded that there is no relation between the photoelec. and the photographic effects in AgBr. Before this article appeared, B. had obtained approx. the same result with AgBr formed by fuming the surface of a Ag plate. His data were obtained by the use of more sensitive app. than that employed by the above-named investigators. In order to prevent deterioration of the AgBr the plate was kept in complete darkness until the time of exposure by which measurements were made. W. G. GAESSLER

Saving overexposures on self-toning paper. ANON. *Assoc. Belge Phot.* **50,** 3–4 (1928).—Overexposed prints on self toning paper may be saved by bathing in a 5% $K_2Cr_2O_7$ soln., followed by rinsing and fixing in 10–15% $Na_2S_2O_3.5H_2O$. The treatment may be applied to citrate paper. L. E. MUEHLER

Colored films (Brit. pat. 285 431) 25.

Photographic films. I. G. FARBENIND. A.-G. Fr. 635,281, Apr. 28, 1927. See Brit. 270,347 (*C. A.* 22, 1552).

Nonstatic photographic film. PAUL C. SEEL (to Eastman Kodak Co.). U. S.

1,687,041, Oct. 9. An electrifiable film such as a pyroxylin compn. carries a light-sensitive coating on one side and on the other side is provided with an antistatic layer contg. paratoluene sulfonamide-formaldehyde resin. U. S. 1,687,042 specifies the similar use of an antistatic film contg. an abietic acid ester such as that of glycerol.

Eliminating static charges from cinematographic films. PALMIRE H. NICOLLIC AND MAURICE J E. CLAUDE. Fr. 635,152, Sept. 29, 1926. The space surrounding photographic or cinematographic films is ionized with feebly radioactive substances emanating from relatively large surfaces to discharge electrostatic charges on the films.

Two-color cinematograph films. J. E. THORNTON. Brit. 285,262, March 8, 1927. A film of the kind described in Brit. 213,647 (*C. A.* **18,** 2476) which is built up by cementing together 2 thin films, each comprising a transparent support carrying a component image in colored colloid relief produced by printing on a ready-colored colloid layer which is developed to remove the unexposed portions of the colloid, is made up by cementing the 2 thin films together with their supports in contact.

Films for color photography. J. E. THORNTON. Brit. 285,227, Jan. 20, 1927. Film material for the production of multicolor cinematograph or other films built up from printed colloid layers without supports as described in Brit. 285,228 (following abstr.) comprises a web of double, triple or quadruple material, the usual width formed by applying to a temporary strippable paper support a colloid film layer which may be non-sensitized so that it must be sensitized before use as by immersion in a Ag, dichromate, Fe or U sensitizer or may be ready sensitized with Ag salts, and may, in either case, be ready colored in stripes of different color. Numerous details are given. Cf. *C. A.* 22, 1739.

Color photography. J. E. THORNTON. Brit. 285,228, Jan. 28, 1927. Positive multicolor films of standard thickness are produced by cementing together in register, with a colloid or cellulose cement, color-record components printed on thin film strips formed of ready-colored sensitized colloid only, without the usual supporting layer. Numerous details are given.

Color photography. SOC. DU FILM EN COULEURS KELLER-DORIAN. Brit. 284,995, Feb. 7, 1927. Optical features.

Color photography. SOC. DU FILM EN COULEURS KELLER-DORIAN. Brit. 285,035, Feb. 9, 1927 In reproducing, by optical projection followed by reversal of the developed copy, color-record images made on films with lenticular elements, a copy is produced having contrasts equal to those of the original image by transforming this image, before copying, into an image having reduced contrasts by subjecting it to reactions such as toning the Ag image either chemically or by mordanting or conversion of the Ag into chloride, bromide, iodide or ferrocyanide

Colored photographs. WM. F. FOX (to Natural Color Pictures Co.). U. S. 1,685,-281, Sept. 25. A positive and a negative image are printed in alignment in a single coating of sensitive emulsion on one side of a suitable base, with unaffected emulsion sep. the images and with the positive image undermost; both images are toned one color, *e. g.*, by salts of V and Fe, and the emulsion material is hardened in proportion to the amt. of tone; the film is dyed with a dye of a second color, *e. g.*, with an acid red dye adapted to act most vigorously on the soft portions of the film.

Photographic sensitive papers. R. SCHWICKERT GES. AND E. BURG. Brit. 284,253, Jan 26, 1927. Light-sensitive layers which can be developed by gases or vapors such as NH_3 or steam contain a hygroscopic substance to accelerate development. Sensitive layers for development with NH_3 may, *e. g.*, comprise diazotized amide acid, resorcinol, $KHSO_4$ and NaOAc or diazotized H acid, H acid, K biphosphate and $MgCl_2$. Lime is also proposed as a hygroscopic substance.

Making composite colored pictures. ROY J. POMEROY (one-half to Famous Players Lasky Corp.). U. S. 1,686,987, Oct. 9. An image of one component of a picture is made on a limited area of a ground and the image area is colored substantially uniformly in a selected color such as mixed naphthol green and "patent blue" to transmit substantially only light of that selected color; the surrounding ground is colored substantially uniformly in a color such as red having a minus relation to the selected image color so that the ground will transmit predominately light of the last mentioned color, an image of another component of the picture is made and the 2 components are selectively printed onto different parts of a fresh actinic surface with printing light of the 2 specified colors.

Polychromatic screen for use in photographic color processes. JOHN G. CAPSTAFF (to Eastman Kodak Co.). U. S. 1,687,055, Oct. 9.

6—INORGANIC CHEMISTRY

A. R. MIDDLETON

Valency. X. Electrometric titration of Vernon's α- and β-dimethyltelluronium bases. FRANK L. GILBERT AND THOMAS N. LOWRY. Univ. of Cambridge. *J. Chem. Soc.* **1928**, 1997–2010; cf. *C. A.* **22**, 1899.—The relative strengths of the isomeric α- and β-$TeMe_2(OH)_2$ were compared by measuring the mol. conds. at 25°. That of the former varied from 3 to 6, while that of the latter varied from 31 to 36 in the range of v = 32–512. These values were increased to about 40, at v = 32, by satn. with CO_2 but were reduced to normal values again by passing a current of purified air through the solns. Cond. titrations of the bases with HCl showed a break at the compn. corresponding to $[TeMe_2OH]Cl$ but there was no indication of the formation either of the normal salt or more basic compd. Potentiometric titrations of the α-base with a glass electrode showed the typical behavior of a weak base, the formation of a nearly neutral hydroxy salt. They gave no indication of the formation in soln. of the dioxyiodide which Vernon prepd. in cryst. form The curve for the β-base, on the other hand, showed a break at about 50% neutralization with HCl, corresponding to the formation of a basic salt, $2TeMe_2O.HCl$, which has not been obtained in the free state. H. F. J.

Free inorganic radicals. P. WALDEN AND L. F. AUDRIETH. Cornell Univ. *Chem. Reviews* **5**, 339–59(1928).—A discussion of the methods of prepn., and phys. and chem. properties of the *halogenoids*, including the formation of compds. with the halogens and among themselves (*interhalogenoids*). The following compds. are described $(SCN)_2$; $(CN)_2$; $(SeCN)_2$; $(OCN)_2$; $(SCSN_3)_2$, *azidocarbon disulfide;* CsI_2CN; CNN_3. CN.SCN; $CN.SCSN_3$; CN.SeCN. Other evidence in support of the halogenoid analogy is offered, such as the existence of *sulfuryl azide*, $SO_2(N_3)_2$, and *carbonyl azide*, CO $(N_3)_2$. The contrast between the halogenoids and $(NO_2)_2$ is considered. H. S.

Supplement to our contribution: Regarding the radical-like alkali salts of a new nitrogen oxy-acid. E. ZINTL AND O. KOHN. *Ber.* **61B**, 2063(1928); cf. *C. A.* **22**, 1292.—Na_2NO_2 reacts in H_2O to form hyponitrite, N_2 and N_2O and not H_2 as indicated by Maxted (cf. *C A.* **12**, 455). The authors claim that Maxted probably found NaOH, $NaNO_2$ and H_2 and no hyponitrite because Na_2NO_2 decomposes when moist N_2 is passed over it. B. E. ROETHELI

Investigations concerning the reactions in solutions of weak inorganic acids which have a tendency to form aggregates. GERHART JANDER. *Z. angew. Chem.* **41**, 201–3 (1928).—Summary of a lecture on the complex acids and alkali salts of W, Sb, Ta, Si and Cr. References are given. E. R. SMITH

The rare earths. [The oxidation of the oxalates of praseodymium and neodymium]. JOSEF ŠVÉDA. Charles Univ., Prague. *Časopis Československého Lékárnictva* **7**, 226–32(1927).—The decompn. of oxalates by heating in O_2 is easily effected at low temps., the product always contains some carbonate. The attainment of const. wt. does not indicate that decompn. is complete. The decompn. of Pr oxalate is effected at a lower temp. and more completely than that of Nd oxalate. In a mixt. of the oxalates (Pr_2O_3 : Nd_2O_3 = 1:1) the decompn. of Nd oxalate is greatly accelerated, but for complete decompn. a higher temp. is required than for the individual oxalates. By calcination of Pr oxalate in O_2, there is formed a dark brown oxide, Pr_6O_{11}, which on calcination *in vacuo* yields O_2 and Pr_2O_3; the latter reoxidizes easily in presence of traces of Pr_6O_{11}. Similar calcination of Nd oxalate yields only Nd_2O_3, contrary to the results of Waegner (*Z. anorg. Chem.* **42**, 118). In calcination of a mixt. of the oxalates of Nd and Pr, the presence of Nd does not interfere with the formation of the higher oxide of Pr, contrary to the results of Marc (*Ber.* **35**, 2370). WILLIAM J. HUSA

Indium. III. A. THIEL AND H. LUCKMANN. Marburg Univ. *Z. anorg. allgem. Chem.* **172**, 353–71(1928).—In is sepd. from other metals by pptn. as hydroxide. Fe and some Cd are still present. The In is treated with excess of NH_3 to remove Cd and with H_2S in acid soln. to remove Fe and Al. Gelatinous In hydroxide is digested on the water bath to form a granular material. Electrolytic deposition of In can be used but the method is not quant. The metal obtained in this way when fused in an inert atm. gives appreciable amts. of water. Extn. of the In as In_2O_3 is exact if certain conditions are followed, this being also true for In_2S_3. In_2O_3 is difficult to obtain pure, its density is 6.75 ± 0.01 and its color is yellow. In_2O, which strongly heated in air transforms to the yellow In_2O_3, is also yellow. T. and L. doubt Winkler's In_4O_5 and In_7O_9 and consider these are represented by InO which they obtained by reducing In_2O_3 with H. In_2S_3 is noticeably volatile at 850° and m. 1050° ± 3°. In_2S_3 m. 653° ± 5° and its density is 5.92 ± 0.01. InS is volatile at 850° and the existence of other

sulfides is indicated by m.-p. detns. of mixts. of In and S. InO is the lightest colored oxide and In_2O is the darkest. In_2O and In_2S are paramagnetic; InO and InS are less so; In_2O_3 and In_2S_3 are indifferent. S. L. B. ETHERTON

Reduction of metallic oxides, and the equilibrium $Zn + CO_2 \rightleftharpoons ZnO + CO$. KARL JELLINEK AND BORIS POTIECHIN. Techn. High School, Danzig. *Z. anorg. allgem. Chem.* **173**, 164–8(1928).—Reduction of sulfides and halides gives easily reproducible equilibria with H but this is not the case with oxides. In the case of CdO and H_2 at 270°, the gases drawn off have 125 vol. % H_2O and 75 vol. % H_2. At 309° they have 55 vol. % H_2O and hence the reaction isochore equation is $\log 25/75 - \log 55/45 = Q/457$ $[(1/545) - (1/582)]$, whence $Q = -21{,}500$. J. and P. examd. $Zn + CO_2 \rightleftharpoons ZnO + CO$ and found at 400–600° almost 100 vol. % of CO when CO_2 was passed over pure ZnO and Zn. For more accurate figures the CO side of the equil. was examd. Pure CO was made by passing pure CO_2 over Zn dust and the residual CO_2 was absorbed in concd. KOH, then in $Ba(OH)_2$ and passed through concd. H_2SO_4 and over P_2O_5. At 565° and atm. pressure, 0.2 vol. % of CO_2 was obtained by passing CO over ZnO. The quantity of CO_2 should be higher and also the vapor of Zn at 565° is 5 mm. so that CO_2 could react with Zn in cold parts of the app. Ch. G. Maier and O. C. Ralston obtained 0.05 vol. % of CO_2, a value even lower than the supposed low value of J. and P. The latter ascribe the difference in values to difference in the ZnO modification used. S. L. B. ETHERTON

Action of phenylhydrazine on oxides and salts of metals. Lead suboxide. II. ERNESTO PUXEDDU. R. Univ. Cagliari. *Gazz. chim. ital.* **58**, 224–31(1928); cf. *C. A.* **10**, 2883.—The unsatisfactory results obtained by other investigators in the formation of Pb_2O from PbC_2O_4 induced P. to attempt its formation by reduction of higher oxides of Pb with $PhHNNH_2$. Expts. show that a large excess of pure $PhHNNH_2$ reduces PbO_2, Pb_3O_4 and PbO to Pb_2O. PbO and $PhHNNH_2$ heated slowly up to 150°, then cooled to 80°, and the alternate heating and cooling between 80° and 150° continued for 1 hr. and the product washed with EtOH and with Et_2O to remove org. impurities yields Pb_2O as a black-brown unctuous powder. If the temp. exceeds 150° or if maintained too long a time at this temp., Pb is formed. Pb_3O_4 does not react with $PhHNNH_2$ at room temp. in darkness, but in sunlight reduction takes place. By heating the mixt. to 150° and proceeding as with PbO, Pb_2O is formed. Pb_2O behaves differently, a violent reaction taking place even at room temp., a mixt. of PbO, Pb_2O and Pb being formed. However, PbO_2 (3 g.) and $PhHNNH_2$ in Et_2O (15 g. in 10 g.) at room temp. for a day form PbO, while if this mixt. is heated to 150°, Pb_2O is formed (after the Et_2O has evapd.). In all these prepns. the products must be washed with EtOH and with Et_2O. The *reduction of $HgCl_2$ and of HgCl by $PhHNNH_2$* was then attempted. Et_2O solns. of $PhHNNH_2$ and of $HgCl_2$ ppt. a yellowish white *compd.*, probably $Hg(NHNHC_6H_4Cl)_2$ and therefore analogous to the $PhNH_2$ deriv. Both $HgCl_2$ and HgCl are reduced to Hg by excess $PhHNNH_2$. $PhHNNH_2$ offers a means for the *detn. of Hg in $HgCl_2$ and in HgCl. In $HgCl_2$.*—Warm gently the $HgCl_2$ and $PhHNNH_2$ for 30 min., then heat at 80° for 15 min., wash the Hg repeatedly first with acidulated water, then with EtOH and finally with Et_2O, dry over KOH (with Hg vapor present) and weigh. *In HgCl.*—The procedure is essentially the same as that for $HgCl_2$. This method gives precise results. C. C. DAVIS

Oxides of iron, especially ferrous oxide. H. GROEBLER AND P. OBERHOFFER. *Stahl u. Eisen* **47**, 1984–8(1927).—The purest prepn. of FeO obtained by heating Fe_2O_3 in a stream of CO and CO_2 at 800° contained 99% FeO when only small quantities (1 g.) of material were used. By heating at 900° the prepn. contained about 15% of metallic Fe, about $^2/_3$ of which could be removed by treating the mixt. with I soln.; the residual FeO contained only 95% FeO. The m. p. of FeO, as detd. by extrapolation from the results obtained with various impure specimens, is 1377°. Röntgenographic examn. of oxides of Fe prepd. by reduction of Fe_2O_3 at 800° shows that the limit of soly. of FeO in ferrosoferric oxide is 5%; with more than 61% FeO the lattice structure of ferrosoferric oxide is entirely replaced by that of FeO, which, therefore, appears to hold 39% Fe_3O_4 in solid soln. FeO retains only traces of Fe in solid soln. B. C. A.

Structure of boron hydrides. GEO. GLOCKLER. Univ. of Minn. *Science* **68**, 305–6(1928).—The idea of the pseudo-atom (cf. Grimm, *C. A.* **20**, 867) is extended to the hydrides of B. The pseudo-atoms in the chemistry of B are related to those in the chemistry of C as follows: $=BH=$ similar to $=C=$, $=BH_2-$ to $=CH-$, $-BH_3-$ to $-CH_2-$ and BH_4- to CH_3-. B_2H_6 would, therefore, be similar to C_2H_4 in that it contains the double bond but differs from it in the complexity of the positive charge within the octet. H. F. JOHNSTONE

Addition compounds of bivalent metal halides and organic bases. V. G. SCAG-

LIARINI AND E. BRASI. Univ. Bologna and Univ. Ferrari. *Atti. accad. Lincei* [6], 7, 411-3(1928).—The influence of the relative concns. of hexamethylenetetramine and of Hg halide on the formation of addn. compds. were detd. Cold, satd. $C_6H_{12}N_4$ in acetone added slowly to satd. $HgCl_2$ in acetone forms at first a white ppt., which microscopically has a characteristic crossed structure. On continued addn. of $C_6H_{12}N$, a very fine ppt. is formed, which microscopically has a structure differing from the ppt. of the earlier stages of the pptn. Analyses of the first and the last portions pptd. showed that 2 compds. are successively formed, *viz.*, the *compd.* $3HgCl_2.2C_6H_{12}N_4$ and the *compd.* $2HgCl_2.C_6H_{12}N_4$. Addn. of cold concd. $HgBr_2$ (1 mol.) in acetone to concd. $C_6H_{12}N_4$ (2 mols.) in acetone pptd. the *compd.* $HgBr_2.2C_6H_{12}N_4$. Under similar conditions but with equimol. proportions, the *compd.* $HgBr_2.C_6H_{12}N_4$ was formed. Cold concd. HgI_2 in acetone added to concd. $C_6H_{12}N_4$ in acetone pptd. the *compd.* $HgI_2.C_6H_{12}N_4$. Because of very slight soly. of HgI_2 in acetone, it was necessary, in order to carry out the reaction in the presence of excess HgI_2, to agitate cold concd. $C_6H_{12}N_4$ in acetone with solid HgI_2, adding $C_6H_{12}N_4$ soln. until the HgI_2 was just consumed. Under these conditions, there was pptd. the *compd.* $3HgI_2.2C_6H_{12}N_4$. C. C. D.

The interaction of cuprous chloride and the chromates of potassium in a solution of sodium chloride. HUBERT J. P. VANN AND VERNON EDGE. Tech. College of Salford. *J. Chem. Soc.* **1928**, 2142-6.—When a dil. soln. of $K_2Cr_2O_7$ was added to Cu_2Cl_2 dissolved in concd. NaCl soln. a green ppt. was formed. Basic cupric chlorides and $Cr(OH)_3$ were probably products of the reaction. When K_2CrO_4 was substituted for the $K_2Cr_2O_7$ the reaction did not go to completion and, besides the products mentioned above, $Cu(OH)_2$ was formed. When the Cu_2Cl_2-NaCl soln. was added to the $K_2Cr_2O_7$ soln. a brown ppt. was formed and the products contained a basic cupric chromate and $Cr(OH)_3$. If K_2CrO_4 was substituted for the dichromate in this case $Cu(OH)_2$ was formed in addn. to the above-mentioned products. H. F. JOHNSTONE

The binary systems of rubidium chloride with strontium chloride, barium chloride and cadmium chloride. FRIEDRICH HOFMANN. *Neues Jahrb. Min. Abt. A, Beil.-Bd.* **55**, 149-62 (1926-7).—In the system RbCl-$SrCl_2$ the following phases were found: RbCl (m. 715°), $RbCl.SrCl_2$ (congruent m. p. at 674°), $RbCl.2SrCl_2$ (congruent m. p. at 646°), $SrCl_2$ (m. 868°); for the system RbCl-$BaCl_2$: RbCl (m. 715°), $2RbCl.BaCl_2$ (congruent m. p. 649°), $BaCl_2$ (monoclinic) transition temp. to cubic $BaCl_2$ at 923°, $BaCl_2$ (cubic) m. 948°; for the system RbCl-$CdCl_2$: RbCl (m. 715°), $4RbCl.CdCl_2$ (incongruent m. p. at 476°), $3RbCl.2CdCl_2$ (incongruent m. p. at 451°), $RbCl.CdCl_2$ (congruent m. p. at 495°), $CdCl_2$ (m. 565°). The thermal and optical method was used. J. F. S.

Nitrogen trifluoride. OTTO RUFF, JOSEPH FISCHER AND FRITZ LUFT. Tech Hochschule, Breslau. *Z. anorg. allgem. Chem.* **172**, 417-25(1928).—Many unsuccessful attempts have been made to obtain a binary N fluoride. NF_3 has now been obtained and its properties examd. Fused dry tech. NH_4 acid fluoride is electrolytically decompd at 125°. A Cu vessel contains the melt and in this is an inverted Cu cylinder which functions as the cathode. To this is attached an insulated graphite rod, the anode. Ten amps. at 7-9 v. were required. The resulting gas contained H_2,NF_3,N_2O,N_2,O_2 and O_3 and was led over granulated KF and then over pyrolusite to remove O_3, HF and water and then cooled to —75°. The more difficultly volatile components are thus removed and the residual gas is passed through 2 glass vessels, one cooled with liquid air and the other cooled with liquid air through which passed a current of chilled H. In the early stages of the research violent explosions occurred which shattered the glass app. The cause of this was traced to O_3; hence pyrolusite was used to convert O_3 to O_2 catalytically. After this no explosions occurred. Pure NF_3 is a colorless gas to —119°; below this it is a colorless mobile liquid and it freezes at —210°. The d. is 71.1. The gas is practically insol. in water at room temps. and is not changed by sparking. It is remarkably stable, does not attack glass, Hg, MnO_2 or potash. Sparked in the presence of water vapor it gives HF, HNO_2 and HNO_3. Sparked in the presence of H it gives N_2 and HF. S. L. B. ETHERTON

Iridium fluorides. O. RUFF AND J. FISCHER. *Z. Elektrochem.* **33**, 560-1(1927).—For the prepn. of IrF_6 and IrF_5 by the passage of pure gaseous F over heated finely powdered Ir, the metal was contained in a boat of calcined fluorspar supported in a tube of the same material and heated electrically. Vessels of fluorspar calcined at 1280° are resistant to F at high temps., and are readily worked mechanically by means of an emery wheel. For analysis of the hexafluoride, reaction with Na_2CO_3 in a Pt crucible was carried out at the temp. of liquid air. Subsequent heating to redness yielded insol. iridium oxide, which was reduced to the metal and weighed. The atomic ratio of Ir to F obtained in this way was 1:6.08. Some properties of IrF_6 and IrF_5 are described. B. C. A.

Studies in metallic nitrides and hydrides. I. I. Zhukov. *Ann. inst. anal. phys. chim.* (Leningrad) **3**, 600–40(1927); cf. *C. A.* **21**, 3800.—A no. of metals were heated in H_2, the quantities of this latter absorbed and the equil. pressures being measured. Na reacts with H_2 above 200°, a product of the compn. NaH being formed. Dissocn. pressures of the hydride were detd. to 4–5 mm. at 285°, 51 mm. at 350°, 75 mm. at 360°, 261 mm. at 390° and 585 mm. at 425°. Ce (99.7% Ce) reacts with H_2 above 300°, forming a compd. CeH_2. The dissocn. pressure is 1–2 mm. at 480–520°. The hydride, CeH_2, shows a very marked soly. for H_2. Its elec. cond. is very small. Expts. on Pd (as Pd foil and Pd black, the latter being prepd. by reduction of $(NH_4)_2$-$PdCl_4$ by hydrazine chloride in a weak alk. soln.) yielded at 0–90° results closely resembling those of Hoitsema (*Z. physik. Chem.* **17**, 1 (1895)). Z. suggests that a solid soln. of H_2 in Pd is formed at the temp. studied but that at higher temps. 2 solid phases of varying compn. are formed. Rh (as Rh black prepd. by reduction of Na_3RhCl_6 by hydrazine chloride in alk. soln.) shows at 0–100° a behavior similar to that of Pd, the H_2 pressure, when plotted against amt. absorbed, showing first an increase, remaining then approx. const. and increasing finally again. Z. concludes that, as in the case of Pd, Rh forms a solid soln. with H_2 Ir (as Ir black prepd. by reduction of $(NH_4)_2Ir_2Cl_6$ by hydrazine chloride) forms at 25° a solid soln. with H_2. The vols. of H_2 absorbed at atm. pressure and 25° by 1 vol. each of Pd, Rh and Ir are, resp., 734, 448 and 807. Absorption of H_2 by Os is negligibly small. G. B. Kistiakowsky

The reduction of metallic sulfides with carbon. N. Parravano and G. Malquori. R. Univ. Roma. *Gazz. chim. ital.* **58**, 279–89(1928); cf. *C. A.* **22**, 3817.—The production of metals from their oxides, by reduction with C, suggested the adaptation of the analogous reaction: $2\ MS + C \longrightarrow 2\ M + CS_2$, to the production of metals from their sulfides. As a beginning a theoretical study was made of the latter reaction from the static point of view, the kinetic point of view being too complicated to be considered at first. The reducibility of a sulfide depends upon the pressure of CS_2 in the reaction above, and a comparison of various sulfides shows that the higher the vapor pressure of the S (p_{S_2}) or the higher the ratio p_{H_2S}/p_{H_2} for the equil: $MS + H_2 \longrightarrow M + H_2S$, the more easily is the sulfide reduced by C. Values of p_{H_2S}/p_{H_2} can be found in the literature, and a comparison of the data gives the following order of reducibility: $Ag_2S > PbS > NiS > FeS > Cu_2S > MnS$. With Acheson graphite, CS_2 was first formed from Ag_2S, PbS, FeS and Cu_2S at 970°, 1100°, 1200° and 1300°, resp. In a similar way it is shown that the reducibility of metallic oxides by C increases with increase in the value of p_{O_2}. A comparison of the reducibility of various sulfides and oxides leads to the conclusion that not only p_{S_2} or p_{O_2} but also the dissocn. consts. of CS_2 or CO_2 and the tendency of the sulfides to dissolve in the metals play a part in the reducibility. With the method already described (cf. *C. A.* **22**, 2091), the values of p_{S_2} were found to be 4, 7.5 and 11.8 mm. of Hg at 423.5°, 431.5° and 439.5°, resp. The greater difficulty of reducing sulfides by C compared with oxides depends upon the fact that with sulfides no reducing gas corresponding to CO is formed. C. C. D.

Lithium sulfite and some derivatives. John A. N. Friend and Donald W. Pounder. Techn. College, Birmingham, Eng. *J. Chem. Soc.* **1928**, 2245–8.—Li_2SO_3.-H_2O was prepd by passing SO_2 into a suspension of Li_2CO_3 in H_2O. The salt may be obtained by evapn. over a H_2O bath or over H_2SO_4 in a vacuum, or preferably, by pptn. with alc. The hydrate deliquesces in the air and oxidizes to the sulfate. When heated to 180° it loses H_2O and the anhyd. salt is formed. This melts with decompn. at 455°. The addn. products of $LiHSO_3$ with Me_2CO and BzH were obtained by passing SO_2 into Li_2CO_3 moistened with H_2O and covered with these reagents. Under similar conditions AcH gave a white product, not analyzed, while AcPh did not react. H. F. J.

Further studies in double-salt formation. I. The formation of copper sodium sulfate. R. M. Caven and W. Johnston. *J. Roy. Tech. Coll. Glasgow* No. **4**, 32–8 (1927); cf. *C. A.* **18**, 3329; **22**, 345, 715.—The influence of each single salt upon the solv. of the other is less at 25° than at 0°, although the double salt $CuSO_4.Na_2SO_4.2H_2O$ (1) is formed at 25° and not at 0°. The formation of complex ions in soln. is not always accompanied by the early appearance of the double salt if it is an endothermic compd.; e. g. in the case of (1) there is not heat energy enough to form the salt below 16.7°. Likewise, the salt $CuSO_4.Na_2SO_4.6H_2O$ which would be formed at a lower temp. is nonexistent. The non-formation of (1) at 0° is proved by the following expt.: (*a*) Na_2-$SO_4.10H_2O$ is crystd. (in a solid mass) at 0° from a (1) soln. satd at 38°, (*b*) from a (1) soln. formed at 10° and (*c*) when (1) is shaken with a little water at 0°. Na_2-$SO_4.10H_2O$ is crystd. first when equimol. solns. of the single salts are evapd. in vacuum at 17.5–18°, but when the mol. ratios of Na_2SO_4 to $CuSO_4$ were 1:1.05 (1) crystd.

first. **II. The formation of manganese, potassium and ammonium sulfates.** *Ibid* 38–41.—Cf. *C. A* **22,** 345. C. H. BADGER

The determination of the structure of hydrogen disulfide. Regarding the action of hydrogen disulfide on phosphorus. III. Compounds. JACOB DODONOV AND HERMAN MEDOX. *Ber* **61B,** 1767–70(1928).—Attempts at detg. the structure of H_2S_2 by treatment with PPh_3 yielded only $(C_6H_5)_3PS$ and H_2S, showing that triamylphosphines and arsines are not so constituted as to hold 2 SH groups permanently. Expts. with PCl_3 yielded P_2S_5, PCl_3S and HCl according to the following reaction: $3H_2S_2 + 3PCl_3 \longrightarrow P_2S_5 + PCl_3S + 6HCl$. It is believed that the mechanism of the reaction is as follows: $PCl_3 + H_2S_2 \longrightarrow PCl_3(SH)_2$, the $PCl_3(SH)_2$ reacting in 2 ways to form $PS_2Cl + HCl$ and $PCl_3S + H_2S$ and finally the PS_2Cl reacting with H_2S to form P_2S_5 and HCl. The above reactions lead to the belief that the structure of H_2S_2 is similar to that of H_2O_2. B. E. ROETHELI

Preparation of cyanogen by wet method. CECILE NOIR AND TCHENG-DATCHANG. *Compt. rend.* **187,** 126–8(1928).—Analysis of gases produced by KCN on soln. of $CuSO_4$ gave $(CN)_2$ 62, CO_2 30, HCN 2.5–3 and air 5%. Imperfections in method of analysis have been found. A new detn. gave $(CN)_2$ 78, CO_2 20 and HCN 1–2%. In order to eliminate the CO_2 it is proposed to prepare directly CuCN from KCN and $CuSO_4$ previously reduced by $NaHSO_3$. The pptd. cyanide of Cu is filtered, washed and oxidized by $FeCl_3$ (heat). L. D. R.

Potassium ferro- and ferricyanides. S. H. C. BRIGGS. *J. Phys. Chem.* **32,** 1422 (1928).—Polemic against F. H. Getman (*C. A.* **22,** 1543). W. T. RICHARDS

The thiocyanates of bivalent platinum. A. A. GRINBERG. *Ann. inst. platine* (Leningrad) **1928,** No. 6, 122–77.—G. has prepd. and studied some of the complex thiocyanates of Pt, in particular compds. of the types $[Pt(NH_3)_2(SCN)_2]$, $[PtPy_2(SCN)_2]$, $[Pt en(SCN)_2]$ and some others. The action of NH_3 or of amines on $K_2[Pt(SCN)_4]$ leads under all conditions to the formation of compds. analogous to the salt of Peyronne, thus of *cis*-compds., confirming the rule of Peyronne. The *cis*-compds. yield under action of thiourea the tetrathiourea complexes in all cases tried, whereas *trans*-isomers give products in which only the acid radicals are substituted by thiourea. The rule of Kurnakov is thus fully confirmed. Heating of the tetraamine compds. does not yield *trans*-isomers throughout, as was suggested by Jörgensen, the acid radicals substituting to a larger extent the NH_3 mols. The *cis*-isomers $[Pt(NH_3)_2(SCN)_2]$ and $[PtPy_2(SCN)_2]$ are less stable than *trans*-compds. on heating in dry state as well as in soln., although there is no direct transformation of the less stable into the more stable configurations. Compds. of the type $[Pt(NH_3)_2(SCN)_2]$ are capable of further addn.; thus the *cis*-isomer yields the complex $[Pt(NH_3)_2SCN(SCNAg)]NO_3$, whereas the *trans*-isomer forms more complicated products with $AgNO_3$. Mol. wt. detns. in org. solvents revealed that no polymerization takes place, their difference being due to a true isomerism. Only the *cis*-$[PtPy_2(SCN)_2]$, when dissolved in $CHBr_3$, shows some assocn. but in acetone this compd. gives the normal mol. wt. G. shows further that the reaction of $[PtCl_4]$ and of $[Pt(SCN)_4]$ complexes leads to the formation of $Pt(SCN)_2$, the complex $[PtCl_2(SCN)_2]$ being quite unstable, whereas a similar reaction of $[Pt(NO_2)_4]$ yields the ion $[Pt(NO_2)_2(SCN)_2]$. G. discusses the theoretical interpretation of the cases of isomerism here studied and concludes that Werner's theory of complex Pt compds yields the best agreement with his exptl. data. G. B. KISTIAKOWSKY

Double salts of selenic acid. JULIUS MEYER AND WILLI AULICH. Breslau Univ. *Z. anorg. allgem. Chem.* **172,** 321–43(1928).—Continuation of the work of comparing complex selenates with complex sulfates. This paper deals with the behavior of the alkali and alk. earth selenates with water, their soly., hydrate formation, etc. To conc. aq. selenic acid 170°/20 mm. is best and on cooling $H_2SeO_4.H_2O$, m. 26°, colorless, crystallizes out. It may slowly decompose into H_2SeO_3. The acid was recrystd. and its purity established. By treating aq. suspensions of the carbonates of Na,K, Ca and Mg in excess with the selenic acid the corresponding normal salts were obtained. K_2SeO_4 was made from 500 g. K_2CO_3 and 750 g. $H_2SeO_4.H_2O$. Its soly. is 9 mols. at 20° and 9.9 mols at 100° in 100 mols of water. It has a small soly. coeff. $Na_2SeO_4.10H_2O$ is obtained below 45° and Na_2SeO_4 above that temp. Its soly. is 546 mols. $Na_2SeO_4.10H_2O$ at 25°, greater than that of the corresponding sulfate. The anhyd. salt is not hygroscopic. Its transition point is 31.8°. $MgSeO_4$.7, 6, 4, $1H_2O$ were obtained. $CaSeO_4.2H_2O$ gave a max. soly. at 18° of 8.1 mols. per 1000 mols. of water whereas the max soly. of the corresponding sulfate is at 38°. $CaSeO_4$.1.5, 1, 0.5 H_2O were also obtained. Generally speaking the simple selenates are more sol. than the corresponding sulfates. S. L. B. ETHERTON

Concerning tetraphosphorus triselenide and phosphorus sulfoselenides. JULIUS

MAI. *Ber.* **61B**, 1807-11(1928).—(I) P_4Se_3 was prepd. by heating Se with P in tetralin at 215-20°. The hot mixt. was filtered and on cooling prismatic crystals of P_4Se_3 sepd. out. The crystals had a d. of 1.31*, m. 242-243° and varied from yellow to red-orange in color. The yield obtained was about 1/3 the theoretical. The reaction can also be carried out in acetylene tetrachloride, however, with lower yields. Moist air attacked the P_4S_3 to form H_2Se. The P_4Se_3 is sol. in cold CS_2 and in boiling C_6H_6, $C_6H_5CH_3$, $CHCl_3$, CH_3COCH_3, CCl_4 and acetylene di- and trichloride. H_2O has little effect; H_2SO_4 dissolves it forming a green soln.; concd. HNO_3 oxidizes it readily; NaOH reacts with it to form Na_2Se and PH_3; it phosphoresces at 160° and more strongly at higher temps. (II) Phosphorus sulfoselenides. Substances believed to be P_4S_2Se (m. 186-87°) and P_4SSe (m. 217°) were prepd. from the elements. Mixts. of P_4S_3 and P_4Se_3 were made up to correspond to the same compds. and were found to have m. ps. of the same magnitude. It is concluded that the sulfoselenides reported are probably only isomorphic mixts. of P_4Se_3 and P_4S_3. B. E. ROETHELI

Silicic acids. ROBERT SCHWARZ. *Zement* **17**, 930-3(1928); cf. *C. A.* **22**, 4028.—Hydrated SiO_2 was prepd. by adding finely powdered $Na_xSi_yO_z$ to chilled 80% H_2SO_4 soln., stirring for 2-3 hrs. and pouring the mixt. into a large vol. of cold H_2O, filtering and washing thoroughly the easily sepd. ppt. When this hydrate is brought into equil. with H_2SO_4, breaks in the vapor-pressure curves occur at 23.06% and 13.03% H_2O corresponding well with H_2SiO_3 and $H_2Si_2O_5$, resp. Chiefly H_2SiO_3 results from the hydrolysis of SiF_4, $SiCl_4$, etc., in the cold. In alkali silicate solns. SiO_3^{-} and $Si_2O_5^{--}$ are in equil.—the formation of $Si_2O_5^{--}$ being favored with increasing H-ion concn. H. F. K.

Recent theories on the constitution of silicates. E. HERLINGER. Berlin-Dahlem. *Z. angew. Chem.* **41**, 488-92(1928).—Much light has been thrown on silicate structure by the study of model silicates, physical-chem. equil. relations, and Röntgenographic analysis. The value of each of these methods is discussed. Three general methods of viewing silicate structure are common. (1) A great many of them can be regarded as assembled structures comprised of small characteristic groups united in varied numerical relation. (2) The elements Si or O can be considered as the nuclei of complex radicals. (3) In the *aluminosilicates*, the Al atom is regarded as the nucleus about which large complexes can be constructed. H. STOERTZ

A method of separation of rhodium and iridium by alloying with bismuth. B. G. KARPOV. *Ann. inst. platine* (Leningrad) 1928, No. 6, 98-100.—K. suggests the following procedure: Raw concentrates contg. Ir, Rh, Pt, Au, Pd and other metals are alloyed with Ag and treated consecutively with HNO_3 and aqua regia. Insol. residues are alloyed with Bi in a reducing atm. (graphite crucible) at 1000° for 2-3 hrs. This alloy is treated with dil. HNO_3 and later with aqua regia (1:1), the insol. residue being weighed as Ir. The purity of the latter is tested by fusion with K pyrosulfate and a repeated alloying with Bi. From the filtrates of the Ag alloy Pt and Pd are sepd. by ordinary methods. Bi-alloy filtrate of HNO_3 is evapd., the residue dissolved in weak HCl and Bi pptd. as oxychloride. The filtrate is tested for Pt and Pd. The aqua regia filtrate is tested for Pt. Au and for traces of Ir. Finally, both solns. contg. Rh are united and Rh is pptd. with Zn. It is washed with HNO_3, alloyed with Ag and, on dissolving the latter in HNO_3, weighed. Examples of analysis show complete agreement of the suggested method with the older method of sepn by means of Pb. It is shown furthermore that the new method represents a considerable (30-40%) saving in working time. The saving is the larger, the larger is the ratio Ir:Rh in the raw materials. G. B. KISTIAKOWSKY

Some salts of uranium. ST. WEIL AND ST. ROZENBLUM. *Bull. trav. inst. pharm. Poland* No. 1, 1-10(11-12, French).—*Basic α-phenylcinchoninate of quadrivalent uranium*, $(C_9H_5NPhCOO)_2UO + 3H_2O$, was obtained in a hot alc. soln. of cinchophen and UCl_4 as a greenish brown powder. *Uranyl α-(carboxyhydroxyphenylcinchoninate*, $C_{17}H_9O_5N.UO_2 + 4H_2O$ was formed as a red ppt. from uranyl acetate and lithium α-salicylcinchoninate in aq. soln. *Basic α-(carboxyhydroxyphenyl)cinchoninate*, $C_{17}H_9O_5N.UO + H_2O$, greenish brown ppt. *Uranium sulfosalicylate*, $[C_6H_3(OH)(SO_3)(COO)]_2U$, green ppt. *Uranyl salicylate*, $[C_6H_4(OH)COO]_2.UO_2 + 5H_2O$, obtained from salicylic acid and uranyl acetate in a hot aq. soln., small needles of orange-rose color. *Uranium salicylate*, $C_6H_4\left\langle{O \atop COO}\right\rangle U + 4H_2O$. *Uranyl salt of guaiacol*, $[C_6H_4(OCH_3)O]_2.UO_2$, obtained from K salt of guaiacol and uranyl acetate in aq. soln. Brown ppt. *Basic β-naphthalenesulfonate of uranium*, $(C_{10}H_7SO_3)_2UO$, obtained from a hot alc. soln. of β-naphthalenesulfonic acid and UCl_4, acidified with HCl. Greenish ppt. *Uranyl p-aminobenzenearsonate*, $[NH_2$-

$C_6H_4.AsO(OH)O]_2UO_2 + H_2O$, obtained from Na *p*-aminobenzenearsonate (atoxyl) and uranyl acetate in aq. soln., red ppt., insol. in water. *Uranyl methylarsonate*, $CH_3.AsO_3.UO_2 + 1^1/_2H_2O$, yellow ppt. *Uranyl p-hydroxy-m-nitrobenzenearsonate*, $[(NO_2)(OH)C_6H_3.AsO(OH)O]_2.UO_2 + 2H_2O$, yellow powder. *Uranyl m-nitroarsanilate*, $[(NH_2)(NO_2).C_6H_3.AsO_3H]_2UO_2 + 2H_2O$, greenish yellow ppt. *Basic uranyl salt of dihydroxydiaminoarsenobenzene*, $[NH_2.C_6H_3.O.UO_2(OH)As]_2 + 5H_2O$, yellow powder.
JAROSLAU KUČERA

Decomposition of water and aqueous chloride solutions by Fe powder (MICEWICZ) 2. Systems with recurrent fusion curves (SMITS) 2. The solubility equilibrium of crystallized $Zn(OH)_2$ in NaOH (FRICKE, HUME) 2. Double salt formation. I. The formation of Cu sodium sulfate (CAVEN, JOHNSTON) 2. The system: aluminum oxide–silicon oxide (EITEL) 8.

7—ANALYTICAL CHEMISTRY

W. T. HALL

More accurate moisture determinations by rapid drying. S. H. MEIHUIZEN. *Chem. Weekblad* **25**, 494–5(1928).—It is shown from examples (milk powder, beet seed, tea) that for easily decomposing substances more accurate moisture figures can be obtained by rapid drying (15 to 20 min.) at 137° (cf. app. of Meihuizen, *Ibid* **20**, 529 (1923)) and using boiling xylene. B. J. C VAN DER HOEVEN

Simple method for determining the concentration of solutions. G. JAEGER. *Ber.* **61**, 1654–9(1928).—The index of refraction of a soln against air at a definite temp. is a phys. const. which can be easily measured If the effects of changes of concn. on this index are known, it is possible to estimate the concn. by measuring the index of refraction. Examples are explained, $CuSO_4$, NH_4Cl, HCl and urea solns being used. W T. H

Sampling churn-drill sludge at the Utah copper mine. L. S. BRECKON. *Eng. Mining J.* **126**, 491–2(1928).—Details are given for sampling low-grade porphyry ore body in which a variation of only a few hundredths of one per cent in the Cu content will be of considerable importance. The selection of the sample is made mechanically Details of interest to the mining engineer are given. W. T H

The use of photoelectric spectrophotometry in microanalysis. H. v. HALBAN AND E. ZIMPELMANN. *Z. Elektrochem.* **34**, 387–93(1928).—The app. and method of photoelec. spectrophotometry were previously described by v. H. and Geigel (cf C. A. **15**, 343) The method can be used for microanalysis if the substance to be detd (1) absorbs light strongly in some spectral region in which the absorption by all other substances present is relatively weak, (2) can be converted by quant. chem. reaction into a substance satisfying condition (1), or (3) can be converted into an insol. ppt which produces a turbidity and thereby increases the absorption of light. The application of the method is illustrated by 2 examples given in detail, namely the *detn of* Fe^{+++} by conversion to $Fe(CNS)_3$ and the *detn. of Ti* by pptn. as TiO_2. In 50 cc. of soln. 0.001 mg of Fe or 0.01 mg. of Ti can be detd. with an accuracy of 1% and 0.00002 mg of Fe or 0.0001 mg. of Ti can be detected. F. L. BROWNE

Chemical development and fixation of latent fingerprints. G. POPP. *Z. angew. Chem.* **41**, 1005–7(1928).—Latent fingerprints may be developed: (*a*) *Mechanically*—By dusting the suspected surface with fine powders, such as Al, soot, indigo, cinnabar, etc., using a soft brush to dust it off, fingerprints may be revealed, later transfers may be made with "adhesive foil" (plaster). These methods are applicable only to certain kinds of surfaces. (*b*) *Chemically*.—Since perspiration contains 0.5–1.5% of solid matter, with NaCl, urea, volatile fatty acids, albumin, cells from the epidermis, and perhaps fat it has been proposed to treat the suspected object with osmic acid, Sudan III, $HgNO_3$, $AgNO_3$, eosin, alcoholic fuchsin, alcoholic tannin, gaseous HF, thiosulfates, etc. For slightly colored or uncolored paper, dilute ink may be used. Far better treatment is with cool I-vapor, which is absorbed better by the fat, urea, etc., than by the surface examd., developing a brown color; treatment must stop as soon as the object itself begins to show a brown color. Heretofore such I-images have had to be photographed quickly. Efforts to fix them with gallic and tannic acids, $AgC_2H_3O_2$, HgCl and subsequent action of H_2S or $(NH_4)_2S$ have not been satisfactory. Paper with the I-image may be preserved between plates of glass temporarily, thus preventing volatilization. The use of reagents to convert the I into "starch-iodide," HgI_2, TlI, AgI, K_2PtI_6 and PdI_2 showed that $PdCl_2$ soln. (1:1000) gave the best results. Float the

paper or dip it into the dil. soln., and then wash thoroughly. To retain ink marks on the paper add alum or tannin to the reagent. The fingerprint record so made can be removed with dil. NH_4OH. If the reagent be made by dissolving $PdCl_2$ in HCl, with gentle heating, it must be neutralized with soda before using. W. C. EBAUGH

Use of one-color indicators in the double-cup colorimeter. HANS KROEPELIN. Univ. Erlangen. *Biochem. Z.* **198,** 225–32(1928).—Instructions are given for the use of the double-cup colorimeter for p_H detns.; also data for the use of indicators of the nitrophenol series. S. MORGULIS

Anthocyanin as an indicator in acidimetry. V. MATULA. *Časopis Československého Lékárnictva* **7,** 121–3(1927); cf. *C. A.* **18,** 2481.—M. examd. the gradations in color in anthocyanin solns. of p_H 1 to 13. The change in color is marked near the neutralization point, a bluish gray color corresponding to p_H 7. M. concludes that anthocyanin from red cabbage may be used as an indicator for ordinary detn. of acids and bases, when these are not too dil. WILLIAM J. HUSA

Contributions to the systematic knowledge of indicators. XI. Phenolphthalein and its derivatives. A. THIEL AND R. DIEHL. *Sitzungsber. Ges. Beförderung gesamt. Naturwissenschaften Marburg* **62,** 472–546(1927).—The color change of phenolphthalein is best explained by Acree's theory which assumes that the phenolic residue assumes a quinoidal structure and there is also an ionizable phenolic group in the *p*-position to the central C atom. The color change takes place in accordance with Pfeiffer's theory of halochromic compds. The purpose of the work here described was to bring together, as far as possible, all the experimentally detd. facts in order to decide the truth concerning some theoretical points of view and to develop methods for estg. the equil in alk. solns. The absorption curves of the various indicators were detd. as well as the end point curves by means of the König-Martens spectral-photometer, using a 50 candle power lamp, at 8 volts. With respect to the influence of substituents, it was found that the chlorophenolphthaleins showed additive properties. The position of the maxima for the addition of 1 Cl group in the first phenol group can be computed on the assumption that $\Delta\lambda = 4m\mu$ and in the second phenol group $\Delta\lambda = 10m\mu$. The effect of adding an NH_2 group is greater. In this case $\Delta\lambda = 22m\mu$ but the effect is not quite 4 times as great when 4 NH_2 groups are added. The reciprocal action of both phenolic groups is necessary to accomplish the deep color in alk. solns. With the nitrophenolphthaleins the conditions are otherwise. The following substances were studied in this investigation, some of them being prepared pure for the first time. *Phenolphthalein, 3'-chlorophenolphthalein, o chlorophenol, 3',3"-dichlorophenolphthalein, 3',5'-dichlorophenolphthalein, 3',5',3"-trichlorophenolphthalein, 3',5',3",5"-tetrachlorophenolphthalein, 3',5',-3",5"-tetrabromophenolphthalein, tetrabromophthalein oxime, 3',5',3",5"-tetrabromophenolphthalein ethyl ester, 3'-nitrophenolphthalein, 2-[3'-nitro-4'-hydroxybenzoyl]benzoic acid, 3',3"-dinitrophenolphthalein, 3',5'-dinitrophenolphthalein, 2-[4'-hydroxydinitro-4'-hydroxybenzoyl]-benzoic acid, 3',5',3"-trinitrophenolphthalein, 3',5',3",5"-tetranitrophenolphthalein, 3' aminophenolphthalein, 3',3"-diaminophenolphthalein, 3,5'-diaminophenolphthalein, 3',5',3"-triaminophenolphthalein, 3',5',3",3"-tetraaminophenolphthalein, phenolphthalein 4"-methyl ether, 3'-nitrophenolphthalein 4"-methyl ether, 2-nitrophenol, 2-6-dinitrophenol, phenol-4,5,6,7-tetrachlorophthalein, thymolphthalein, bromophenol blue, brilliant green, phenolphthalein oxime, 3-aminophenolphthalein 4"-methyl ether, 3'-aminophenolphthalein 4"-methyl ether oxime, phenolphthalein 4"-methyl ether oxime, 3'-nitrophenolphthalein oxime, 3',5'-dinitrophenolphthalein oxime.* G. SCHWOCH

Colorimetric methods in the foundry laboratory. HUGO FREUND. *Giesserei* **15,** 133 4(1928); cf. *C A.* **22,** 2337.—Optical-analytical methods, which have been in use in smelting and steel labs, are recommended for use in foundry labs. The colorimeter is described. Customary methods for detg. the combined C in pig and cast Fe, the Mn, the Cu and the Ti are given. J. BALOZIAN

Detection of arsenic in cadavers. G. POPP. *Z. angew. Chem.* **41,** 856–8(1928).—An interesting account concerning some toxicological forensic work in connection with the trial of the German poisoner Hopf. The bones of a cremated corpse will show probably only about 0.1% of the total As contained in the human body at the time of death. From the bone powder, all the As can be extd. by leaching with dil. NaOH. W. T. H.

Colloidal arsenic trioxide in the arsenic determination. E. G. MAHIN AND A. F. DOYLE. Univ. Notre Dame. *Proc. Indiana Acad. Sci.* **37,** 269–72(1927).—In detg. the As content of insecticides according to the directions of the Assoc. Offic. Agr. Chemists, Gooch's method is recommended to reduce the As to the tervalent condition by treatment with KI in acid soln. Usually a brownish color develops first which is due to dissolved I_2. The directions call for the boiling off of the liberated I_2 but if the boil-

ing is continued too long, a yellow color develops in the concd. soln. which is due to volatilizable AsI_3. To avoid loss of AsI_3, the usual custom is to pay no attention to the final color of the *concd. soln.* and to stop boiling when, as Gooch recommended, a certain vol. is reached. It is pointed out here that the color can also be avoided by limiting the amt. of KI added for the reduction of the As. S. L. B. Etherton

Ceric salts for quantitative analysis: determination of antimony in the presence of arsenic. Hans Rathsburg. *Ber.* **61B**, 1663–5(1928).—Tervalent Sb solns. can be titrated with 0.01–0.05 *N* $Ce(SO_4)_2$ solns. and the end point detd. electrometrically or by the decolorization of methylene blue, Congo red, methyl orange or methyl red. Then, if tervalent As is also present, further titration will give indication of a second electrometric end point or the As can be titrated with $KBrO_3$ soln. W. T. H.

The oxalate method for separating calcium and magnesium. William T. Hall. Mass. Inst. Tech. *J. Am. Chem. Soc.* **50**, 2630–3(1928).—The presence of Mg makes it necessary to add more $C_2O_4^{--}$ than would be necessary otherwise to ppt. CaC_2O_4 completely, but if this excess is made too large the subsequent pptn. of $MgNH_4PO_4$ will be incomplete unless NH_4 salts are first removed by ignition. W. T. H.

The use of gelatin oleate mixtures for the demonstration of small amounts of calcium. Samuel Amberg, John Landsbury and Frances Sawyer. The Mayo Foundation. *J. Am. Chem. Soc.* **50**, 2630–3(1928).—Na oleate in glycerol at p_H 7.2–7.8 can be used to detect 0.0005 mg. of Ca in 1 cc. but the reaction is not sp. for Ca. W. T. H.

Determination and separation of chromium, iron, aluminum and phosphorus. K. K. Järvinen. *Z. anal. Chem.* **75**, 1–27(1928).—Various methods were tested for the oxidation of Cr and it was found that the oxidation by Br_2 in cold alk. soln. was most satisfactory. To accomplish this add Br_2 to the acid soln. and then make alk gradually and finally heat to complete the oxidation. For the sepn. of Fe and Al it is convenient to ppt. the Fe by NH_4OH and Na_2S, filter and ignite the ppt. to Fe_2O_3. An iodometric method for the detn. of Fe is based upon treatment of the ferric soln with KI, boiling off the liberated I_2 and absorbing it in NaOH: after adding acid, the I_2 in the distillate can be titrated with thiosulfate. For the analysis of a mixt. contg about 0.1 g. of Cr and corresponding quantities of Fe, Al and some P_2O_5 the following procedure is recommended: To 100–200 cc. of the soln. add 1–2 cc. of Br_2 and add NaOH slowly until about 10 cc. is present in excess. After about 15 mins. dissolve the ppt. in the least possible quantity of HCl and again make alk. Then make acid once more, heat on the water bath, add 50–100 cc. of water and boil off the excess Br_2, using moist iodo-starch paper to test the vapors. To the hot soln. add 10–20 cc. of 2 *N* $(NH_4)_2HPO_4$ (at least 1 mol. for each atom of Fe and Al) and ppt. $FePO_4$ and $AlPO_4$ by adding NH_4OH dropwise. Cool, dil. to exactly 250 cc., mix and filter. Make half of the filtrate strongly acid with H_2SO_4, using about 5 cc. concd. acid for each 100 cc. of soln. Add KI and titrate the I_2 liberated by the $Cr_2O_7^{--}$ with thiosulfate. Dissolve the phosphate ppt. in HCl, transfer the soln. to a non-tubulated retort, add 2 g. of KI and distil off one-half of the liquid (50–100 cc.) while keeping the neck of the retort immersed in 10 cc. of 2 *N* NaOH dild. with 50 cc. of water Cool, make acid and titrate with thiosulfate. In another portion det. the PO_4^{---} content and the Al by difference. W. T. H.

Gravimetric determination of fluorine as calcium fluoride using membrane filters. G. G. Kandilarow. *Ber.* **61B**, 1667–71(1928).—The gravimetric detn. of F^- has always proved a difficult problem and the customary procedure has been to ppt. $CaCO_3$ and CaF_2 together in order to get a filtrable ppt., subsequently dissolving out the $CaCO_3$ by treating the ignited ppt. with AcOH, after which another ignition and weighing is necessary. If a membrane filter is used it is unnecessary to ppt. $CaCO_3$ together with the CaF_2. To transfer the CaF_2 ppt. to a crucible, it is necessary first to dry the filter and ppt. in a suitable vacuum desiccator. Moreover, if the soln. contains some NO_3^- anions, the CaF_2 ppt. will coagulate more promptly. For the detn. of F, therefore, it is recommended to add to the original soln. of fluoride, 0.5–1.0 g. of $NaKCO_3$, neutralize with HNO_3 until methyl red begins to change color, boil off CO_2 and continue adding HNO_3 until, on heating, the yellow color of the indicator does not return. Then make distinctly acid with the 1–2 drops of dil. HNO_3, add a slight excess of $CaCl_2$, heat nearly to boiling and allow to stand overnight before filtering with the membrane filter. Dry the filter an hour in a vacuum desiccator, transfer the ppt. to a crucible and heat 30–40 min. in an elec. furnace at about 500°. W. T. H.

Colorimetric iron determination with potassium thiocyanate. L. S. van der Vlugt. Central Lab. Volksgezondheid, Utrecht. *Chem. Weekblad* **25**, 495–6(1928).—The presence of salts, particularly phosphates and sulfates, influences the color intensity

of $Fe(CNS)_3$. More thiocyanate ions and higher acidity counteract this effect. For practical purposes at the salt concn. of city water it was found that the following procedure gave dependable results. In a 300-cc. Erlenmeyer flask acidify 100 cc. water with 10 cc. dil. H_2SO_4 (1:5) and add 3 to 4 cc. 5% iron-free $K_2S_2O_8$. Boil for 5–10 min.; if the soln. is not then colorless, add more persulfate and boil again. Cool, filter, transfer to a 100-cc. colorimeter glass, fill up to 90 cc. and add 10 cc. 20% KCNS. Immediately compare the color with standards obtained by increasing quantities of ferric soln. + 4 cc. 5% $K_2S_2O_8$ and quantities of acid and KCNS equal to those of the treated soln. Mohr's salt is recommended as standard for iron. The limit of accuracy is 0.1 mg. Fe per l. B. J. C. VAN DER HOEVEN

Cupferron. Notes on its use in quantitative analysis. GRABER. *Ing. chim.* **16**, 87–93(1928).—A method is given for the detn. of Fe, Ti, Al and Cr and the use of cupferron for the sepn. of the rare earths is discussed. P. THOMASSET

Determination of iron in red lead. H. HEINRICHS. *Z. angew. Chem.* **41**, 450–3 (1928).—The usual method of detg. Fe in red lead by dissolving the sample in HNO_3, pptg. the Pb as $PbSO_4$, and weighing the Fe as oxide gives low results owing to the insoly. of part of the Fe in HNO_3 and to adsorption of $Fe_2(SO_4)_3$ by the $PbSO_4$ ppt. Correct results may be obtained by the following colorimetric method: 10 g. of the sample are mixed with 25 cc. of a cold satd. soln. of $NH_2OH.HCl$, and the mixt. is boiled for 10 min. with 50 cc. of HCl (d 1.19). The $PbCl_2$ is dissolved completely in 400 cc. of boiling water and the soln. set aside overnight. The liquid is decanted, evapd. to 100 cc., and again allowed to crystallize. The second filtrate is treated with NH_3, the $Fe(OH)_3$ ppt. collected and dissolved in HCl, and the Fe detd. colorimetrically with thiocyanate. A blank test should be carried out using the same quantities of reagents as in the analysis. A small, gray, spongy residue after dissolving the sample in the acid mixt. is metallic Pb, the presence of which is objectionable in red lead used for glass frits. B. C. A.

Determination of very small quantities of nitrogen. RUDOLPH EHRENBERG. Univ. Göttingen. *Z. ges. exptl. Med.* **56**, 466–9(1927).—The digestion is carried out in the usual manner. The distn. app. is of quartz with ground joints, the distg. flask having a capacity of 15 cc. making 25 cc. including the condenser. The receiver holds 10 cc. and before distn. 5 cc. 0.001 *N* $Pb(NO_3)_2$ is added, and 3 cc. 15% NaOH to the distg. flask contg. the digested mixt. The mixt. is distd. for 15 min. and the flame is adjusted so that 3.5 cc. distillate comes over. The pptd. $Pb(OH)_2$ is centrifuged down and 1 cc. of the clear liquid is pipetted into a centrifuge tube and 0.5 cc. radioactive 0.001 *N* $Pb(NO_3)_2$ and 0.5 cc. 0.001 *N* K chromate satd. with NaCl are added. Equal fractions of radioactive and inactive Pb are pptd. This is centrifuged and 1 cc. pipetted onto a watch crystal, and left on the water bath for at least 9 hrs., after which the radioactivity is detd. with the electrometer, and compared with a control. Samples contg. only a few thousandths of 1% N can be detd. by this method. F. L. DUNN

New method for quick mercury analysis that is simple and reliable. LETUS S. STRICKLER. *Eng. Mining J.* **126**, 539(1928).—The method described is a modification of the Holleway-Eschka method for detg. Hg in ores. By changing the flux, the presence of free S or of org. matter does no harm. This flux consists of 5–6 g. of CuO, 2–3 g. of powdered Ag and 2 g. of CaO. The precautions necessary to get proper amalgamation of the Ag sheet by the volatilized Hg are mentioned. W. T. H.

Micro-estimation of potassium as cobaltinitrite. ALBERT LEULIER, LÉON VELLUZ AND HENRI GRIFFON. *Bull. soc. chim. biol.* **10**, 891–904(1928).—The history of the K cobaltinitrite reaction is reviewed with 26 references to the literature. The author's technic fills about 3 pages and yields results with an error generally less than 3%. L. W. RIGGS

Micro-chemical determination of phosphorus. Notes on the modifications of Denigès method by V. V. Ciurea. IULIU VOICU. Univ. of Bucarest. *Bull. soc. chim. Roumania* **10**, 50–5(1928); cf. *C. A.* **22**, 3370.—Instead of the colorimetric comparison of standards, C. has recommended the use of Cl_2 water for the titration of Denigès compd., the amount of Cl_2 for complete discoloration being in ratio with the quantity of P present. V. cannot check C. and finds that a great excess of Cl_2 is necessary to cause only partial discoloration and concludes that this method cannot be used as given by C. P. THOMASSET

The predetermination of the sulfur content of cast iron from cupola-furnace practice. BERNHARD OSANN. Bergakademie Clausthal. *Giesserei Z.* **15**, 204–6(1928).—The S content of cast Fe may be detd. in advance by classification calcns. Hitherto unpublished results and examples of the calcns. are given. In the first method it is assumed that 30% of the S in the coke unites with the Fe and the rest is in the gases;

25% of the S in the charged Fe is slagged, while 75% remains behind. Calcns. using these assumptions are verified exptly., the differences between the 2 being 0.003% (av.). In a 2nd. method of representing the desulfurization process, it is assumed that the S content of the Fe is increased by the unvaporized S in the coke; of this increase 12% is slagged. The desulfurization process is shown in its true sequence by this method. However, the first is simpler. J. BALOZIAN

Studies on the exact determination of thorium after precipitation as hypophosphate. FRIEDRICH HECHT. *Z. anal. Chem.* **75,** 28–39(1928); cf. *C. A.* **22,** 3861.—Th is pptd. completely in a soln. contg. 10% HCl, or more, as $ThP_2O_6.11H_2O$ by means of $NaH_2P_2O_6$. The ppt. is practically insol. in water, acids and alkali hydroxide solns. The elements most likely to ppt. with the Th are Zr, Hf, Ce and Ti. It is shown here, however, that there is little danger with respect to Ce because hot HCl reduces Ce^{++++} to Ce^{+++}. It is not yet clear whether there is any interference by Zr or Hf. Upon strong ignition the ppt. of ThP_2O_6 is changed to ThP_2O_7 but it is very difficult, if indeed possible, to ignite to a const. wt. although it is now shown that the wt. of the ppt. is a little too high even after very prolonged ignition. It is best, therefore, to convert the ppt. to some other form for weighing. Rosenheim's method, as modified by Wirth (*C. A.* **6,** 3379), is suitable for decompg. the hypophosphate ppt This consists in digesting the ppt., together with the filter, with 50 cc. of hot concd. H_2SO_4 and gradually adding small portions of $NaNO_3$. Then, instead of expelling practically all of the H_2SO_4 as Rosenheim did (*C. A.* **7,** 38) enough acid is left so that a clear soln. is obtained on dilution, from which the Th can be pptd. as oxalate. Or, if there is objection to this, the H_2SO_4-H_3PO_4 soln can be neutralized with NH_4OH and the Th ppt. filtered off. Rosenheim assumed that this ppt. was $Th(OH)_4$ but this is not true. It contains considerable PO_4 and is more likely to be $Th_3(PO_4)_4$. This ppt. dissolved in dil. HCl and from the soln. $Th(C_2O_4)_2$ can be pptd. It is also possible to get an approx. value for the ThO_2 content by fusing the hypophosphate ppt. with $NaKCO_3$, leaching with water, filtering and igniting the insol residue. It is far better, however, to fuse this last residue with $K_2S_2O_7$, dissolve this melt in dil. HCl, ppt. the Th as $Th(C_2O_4)_2$ and ignite to ThO_2 This last method is fully as good as the procedure recommended by Rosenheim and by Wirth W. T. H.

The acid decomposition of iron carbide in the presence of ferrous ions. R. STENKHOFF. *Mitt. Versuchsanst. Deutsch. Luxemburg Bergwerks- u. Hütten A.-G. Dortmünder Union* **2,** 75–81; *Chem. Zentr.* **1927,** II, 1456.—As a supplement to the work of Schenk and Stenkhoff (*C. A.* **21,** 2091) the following may be said: For the *detn. of* Fe_3C by the isolation of the carbide from carbide-contg. iron correct values are obtained only when strongly dissociated acids are used as solvents, and when the proper care is taken frequently to renew the acid. Concg. the ferrous salts effects a sepn. of C from Fe_3C. It is well to use acids which do not have a tendency to form complexes and which are not of an org. nature. The C elimination may be increased by the formation of complexes and the adsorption of org. acids may give high results in the detn. of carbide C J. S. REICHERT

The determination of free lime. H. RATHKE. Tech. Hochschule Breslau. *Tonind. Ztg.* **52,** 1318–21(1928).—The defects of the Emley NH_4OAc method including the harmful effect of the water set free in the reaction and the inconvenience of titrating a boiling soln. have been largely overcome by using 0. 1 *N* tartaric acid in abs. alc. Add to 0.5 g. of cement or other finely ground solid 10 cc. of abs. glycerol, shake well and heat until white fumes appear. Dil. with 100 cc abs. alc., add a few drops phenolphthalein and titrate. The addn. of a little water does not have much effect on the detn. of free CaO in cement or in monocalcium-and dicalcium silicates, but has a bad effect when working with Thomas slag. F. O. ANDEREGG

Separation and titrimetric determination of lime and magnesia. R. SCHMIDT. Landesanst. f. Wasser-, Boden- u Lufthyg., Berlin-Dahlem. *Kl. Mitt. Ver. Wasserversorg. Abwässerbeseitig* **3,** 21–3; *Chem. Zentr.* **1927,** II, 1879.—The well-known method of sepn. of CaO and MgO by means of Blacher's palmitate soln. is described in detail. C. C. DAVIS

New method of volumetric estimation of mercuric oxide. PRIYADARANJAN RÂY AND JYOTIRMOY DAS-GUPTA. *J. Indian Chem. Soc.* **5,** 483–5(1928).—When HgO is shaken with cold $Na_2S_2O_3$ soln. the following reaction takes place: $HgO + 2\,S_2O_3^{--} + H_2O \longrightarrow [Hg(S_2O_3)_2]^{--} + 2OH^-$. By titrating the liberated hydroxyl with standard acid, a measure of the HgO, is obtained. W. T. H.

Analysis of lead-zinc ores. FRANCESCO GAETA. *Rass. min. met. ital.* **68,** 71–2 (1928).—A procedure based on standard methods is given. C. C. DAVIS

Analysis of electrolytically deposited lead peroxide by the method of Lux. M. G.

MELLON, W. F. REED AND H. L. WILKINS. Purdue Univ. *Proc. Indiana Acad. Sci.* **37**, 255–8(1927).—The method of Lux consists in dissolving the PbO_2 in HNO_3 and a known quantity of oxalic acid, finally titrating the excess of the latter with $KMnO_4$. Difficulty was encountered by the fading of the first apparent end point. Better results were obtained when the oxalic acid was replaced by H_2O_2. S. L. B. E.

The analysis of chlorine bleaching solutions. H. SUNDER. *Chimie et industrie* **Special No.**, 467–70(April, 1928).—A description of the method of detg. NaOH, Na_2CO_3, $NaHCO_3$, Cl_2, NaOCl, HOCl, $NaClO_3$ and $NaClO_2$. The detn. of HOCl and NaOCl is based on the reactions: HOCl + 2KI = KCl + KOH + I_2 and NaOCl + 2KI + H_2O = NaCl + 2KOH + I_2, which were indicated by Lunge, but have apparently not been used to date. It is carried out by adding KI and then a measured excess of 0.2 *N* HCl, titrating the liberated I_2 with $Na_2S_2O_3$ and then the excess HCl with NaOH. If T = cc. 0.1 *N* $Na_2S_2O_3$, t = cc. 0.2 *N* HCl added, t_1 = cc. 0.2 *N* NaOH in the back titration, x = cc. 0.1 *N* HCl required to neutralize the KOH formed from HOCl and y = cc. 0.1 *N* HCl required to neutralize the KOH formed from NaOCl, then $x = T - 2(t - t_1)$ cc 0.1 *N* $Na_2S_2O_3$ for HOCl and $y = 4(t - t_1) - T$ cc. 0.1 *N* $Na_2S_2O_3$ for NaOCl. A. PAPINEAU-COUTURE

Colorimetric determination of carbon disulfide in gas. G. G. DÉSY. Koppers Co Lab., Pittsburgh. *Proc. Am. Gas Assoc.* **1927**, 1440–1.—The gas to be tested (100–1000 cc.) is passed through Bowen bulbs contg. 10% KOH soln., and through concd. H_2SO_4, into a gasometer or Tutweiler buret, where its vol. at atm. pressure is noted. The gas is then passed through a bent glass tube with capillary outlet, into 1 cc. of alc. KOH contained in a test tube. After a measured vol. of gas is passed, the soln. is washed into a Nessler tube, dild. to about 48 cc. with distd. H_2O, and made slightly acid with AcOH, using phenolphthalein as indicator. Four drops of 0.05 *N* $Cu(OAc)_2$ soln. are added and the contents mixed. The color so obtained is compared with the color from known amts. of the standard Et xanthate soln. which has had the same treatment. The method is accurate to about 10% of the amt. of CS_2 present. J. H. P.

Practical method for the analysis of chromite. BERTHET. *Chimie & industrie* **Special No.**, 133(April, 1928).—On the assumption that a sample of chromite may be contaminated with serpentine or other mineral, a scheme is given for the detn. of loss on ignition, SiO_2, S, Fe, Al, Mn, Ca and Mg as well as Cr. The original attack of the mineral is by Na_2O_2 in a Ni crucible, a sep sample being used for the detn. of Cr. The aq. ext. of the melt is used for the detn. of S in the other sample and the insol. residue used for the other detns. The details of the procedure are, for the most part, along conventional lines A. PAPINEAU-COUTURE

Determination of small amounts of carbonate in the presence of sulfide and chloride, with particular reference to the analysis of metallic corrosion products. W. H. J. VERNON AND L WHITBY. *J. Soc. Chem. Ind.* **47**, 255–8T(1928).—For decompg. the sample use a mixt. of H_3PO_4, d 1.75, and half as much water. H_2S is best absorbed by powd. Cu (not reduced by H_2) and HCl by *p*-nitrosodimethylamine. These 2 absorbents proved far better than those usually recommended. W. T. H.

Analytical application of iodine trichloride for oxidations and of sodium formate for reductions. ERWIN BIRK. *Z. angew. Chem.* **41**, 751(1928).—By satg. I with Cl_2 at −79° it is easy to prep. ICl_3 and this substance is a useful oxidizing agent. *E. g.*, it dissolves Au and U chlorides very easily. Na formate is easily oxidized to $Na_2C_2O_4$ at the fusion temp. so that it can be used to advantage as a reducing agent in many dry reactions. Thus by fusion with Li_2CO_3 and $NaCO_2H$ it is easy to detect W in the dry way, forming a Li-W bronze. W. T. H.

The electrometric titration of hypochlorite and hypochlorite-carbonate mixtures. A RIUS AND V. ARNAL. *Trans. Am. Eletrochem. Soc.* **54** (preprint), 7 pp.(1928).—An electrometric method was developed using 0.1 *N* NaOH soln. Results indicate that neutralization occurs in a 1-stage reaction. Since the potential of a Cl electrode varies with the p_H of the soln., hypochlorite, alkali carbonate and free hydroxide can be detd. by a single titration. In the presence of NaOH and Na_2CO_3 in soln, 3 distinct inflection points on the titration curve were obtained corresponding to NaOH + $^1/_2Na_2CO_3$; NaOH + Na_2CO_3; and NaClO, resp. C. G. F.

The determination of hydrogen iodide by the distillation method and the behavior of ferric chloride with silver iodide. ALEXANDER JÜRGENS. *Pharmacia* **1926**, No. 5, 3 pp.; *Chem. Zentr.* **1927**, II, 1494.—The property of a $FeCl_3$ soln. to liberate I from AgI on boiling was used as a method for the *detn. of I.* The app. consisted of a round-bottom flask with a constricted neck and a glass tube sealed on a Peligot tube with definite calibration, and cooling device of the same height as the tube. The I compd. is dissolved, treated with the $FeCl_3$ soln., the I is distd. over and collected in

a KI soln., and titrated with 0.1 to 0.02 *N* $Na_2S_2O_3$ soln. The results are not very accurate because the action of boiling water converts some of the I into HI which escapes titration. The $FeCl_3$ soln. must be free from Cl and HNO_3. The authors state that a complete conversion of AgI into AgCl and I is not effected with $FeCl_3$ soln. Only about 25% of the AgI is converted. J. S. REICHERT

The analysis of nitrates. P. RISCHBIETH. *Chem.-Ztg.* **52,** 691(1928).—Directions are given for detg. the nitrate content in 2 ways on one and the same sample. For a sample of nitrate weighing about 0.1 g., carefully weigh out a little less than 0.17 g. of Fe wire. Connect with a CO_2 generator, add 3 cc. of concd. HCl and sweep out all air from the app. Heat the flask till all of the Fe dissolves. Cool and add the weighed sample of nitrate. Heat till the dark color disappears from the Fe^{++} soln. and pass the evolved NO, with the aid of the CO_2 stream, into a gas pipet contg. KOH soln. Det. the quantity of nitrate by the vol. of NO obtained in the pipet and by the vol of $KMnO_4$ required to react with the excess Fe salt. The 2 values should agree. W. T. H.

Rapid method for the determination of phosphine in acetylene. R. GRANJON. *J. acétylène* No. **61,** 572-5(July-Aug., 1927); *Chimie & industrie* **20,** 258(1928).—C_2H_2 is passed through 10 cc. of a standard soln. contg. 10 g. $HgCl_2$ and 20 g. KCl per l. (which absorbs PH_3 with formation of a yellowish ppt. of Hg phospho-chloride) until the reagent has been exhausted (shown by the darkening of $AgNO_3$ paper suspended over the soln.). If *V* is the no. of l. of C_2H_2 required, $1.5 \times 100/V = PH_3\%$ by vol. A. PAPINEAU-COUTURE

Titrimetric determination of sulfuric acid in water. A. DOBROWSKY. *Allgem Z. Bierbrauerei Malzfab.* **55,** 277-8; *Chem. Zentr.* **1927,** II, 2701.—The $BaCrO_4$ method of Andrews in the form proposed by Windisch and Lampe (*Analyst* **48,** 66(1923)) for the detn. of H_2SO_4 was investigated thoroughly. It was found that with very low concns of SO_4 the errors are great. The results are always too low, which may be explained by the fact that the $BaCrO_4$ used in the detn. contains other sol. Ba salts which also ppt. the sulfate. Since Ba salts are removed only with difficulty from the $BaCrO_4$ ppt., a method for the prepn. of pure $BaCrO_4$ is given. The chief value of the prepn lies in the fact that not more than $^1/_3$ of the quantity of Ba salt necessary for the pptn is taken and the K_2CrO_4 soln. contg. pure NH_3 is used. C. C. DAVIS

Gravimetric determination of sulfuric acid in the presence of antimony. S. VON FINÁLY. *Z. anal. Chem.* **75,** 17-27(1928).—The purpose was to find a more convenient, and possibly more accurate, method for detg. S than by fusion in the dry way. The results of numerous expts. indicate that in the presence of Sb^{+++} the following directions give good results. Evap. the soln. to dryness on the water bath, if, as is often the case, a sulfide ore has been decompd. by Cl_2. To the residue add 0.5 g. of NH_4Cl 4 g. of tartaric acid, 70 cc of *N* HCl and 30 cc. of water. Heat to boiling and add dropwise 10 cc of 10% $BaCl_2$. After allowing the soln. to stand for 24 hrs., filter on a cotton mat, wash with 25 cc. of cold water, then with 25 cc. of hot water and finally with 10 cc. of pure acetone. Drain off the acetone with the suction pump, dry 2 hrs. at 130° and weigh the $BaSO_4$. According to the wt. of the ppt. apply a correction which varies quite uniformly from +0.9 mg. with 20 mg. of $BaSO_4$ to −4.5 mg. with 0.4 g. of $BaSO_4$. W. T. H

A contribution to the determination of water by distillation with hydrocarbons. W. BOLLER. *Chem.-Ztg.* **52,** 721(1928).—To prevent drops of H_2O adhering to the sides of the measuring tube, the condenser tube is drawn to a fine point which reaches nearly to the bottom of the measuring tube. J. H. MOORE

Methods and newer electrodes for p_H determinations. TH. FASOL. *Collegium* **1928,** 435-40.—A review. I. D. C.

The p_H of distilled water. C. VAN DER HOEVEN. *Collegium* **1928,** 440 3. The H electrode cannot be used to measure the p_H of distd. H_2O because of low cond. Quinhydrone itself gives an acid reaction and so gives "acid errors" which are smaller the greater the buffer action of the soln. The quinhydrone electrode did not give p_H values above 5.4 for boiled distd. H_2O. The colorimetric method may give appreciable errors but good results can be obtained with low concns. of neutralized indicator solns. (*e. g.*, with the Na salt of methyl red). I. D. C.

Quantitative organic microanalysis. RALPH T. K. CORNWELL. *J. Chem. Education* **5,** 1099-1108(1928).—A popular account of the work of Pregl and others on the analysis by combustion of a few mg. of material. W. T. H

Partial decomposition of alkaline chlorides in the course of incineration, in particular of nitrogenized organic materials. P. FLEURY AND P. AMBERT. *Bull. soc. chim. biol.* **10,** 869-79(1928); cf. *C. A.* **22,** 2182.—Ten cc. of a 3% soln. of NaCl was

mixed with 0.4 g. of org. material and was evapd. to dryness on the water bath. The residue was heated slowly in a muffle furnace to dull redness until the ash was white. When necessary, the ash was taken up with water, evapd. and reheated. To the cooled ash was added 10 cc. of 0.1 *N* H_2SO_4 and phenolphthalein and the mixt. was allowed to stand on the water bath for several min. when the excess of H_2SO_4 was titrated back with standard $Ba(OH)_2$ soln. In this way 22 common org. substances were tested, of which 18 showed an alky. equiv. ranging from 0.18 for benzoic acid to 4.56 cc. 0.1 *N* NaOH for xanthine. There was a loss of Cl. The alky. of the residue appeared to be due to a mixt. in variable proportions of Na_2CO_3 and NaOH. The results account for the alky. of the ash of the gastric juice and of other org. substances contg. Cl.
L. W. RIGGS

Destruction of organic matter in toxicological investigations. P. E. HEEDERIK. Univ. Leiden. *Pharm. Weekblad* **65**, 861–79(1928).—A comparison was made of As and Hg detns. in horse meat, using various methods for destroying org. matter. In the Fresenius and von Babo method the destruction is incomplete, but if the As is distd. as $AsCl_3$ the recovery is practically quant., whereas detn. as $Mg_2As_2O_7$ gives too low results Hg is recovered quant. The Kerbosch method gives good results for As if the app. is slightly modified, but low results for Hg. Addn. of $KMnO_4$ as catalyst is not advantageous. The Wagenaar method is more rapid, but the large amt. of H_2SO_4 used is objectionable; const. attention is required and recovery of Hg is incomplete. In the Magnin and Stettbacher methods the destruction is incomplete and only small quantities of material can be used. Recovery of Hg is good. The Fresenius and von Babo method gave the most satisfactory results. A. W. DOX

Determination of carbon and of hydrogen without a catalyzer. IVAN MAREK. *Bull. soc. chim.* **43**, 910–2(1928).—A simple and effective *elec. furnace* is described for combustion of org. substances and suitable absorbing vessels are shown. W. T. H.

The determination of free carbon in tars, pitches and the like. E. BERL AND H. SCHILDWÄCHTER. *Brennstoff-Chem* **9**, 137–8(1928).—A 5-g. sample is heated in an autoclave with 200 cm. tetralin at 240–250° under 12–13 atm. for 2 hrs. The soln. is now filtered on a 3/5–7 Schott glass filter crucible, washed with 50 cm. hot tetralin and 100 cm. C_6H_6, dried at 150° in CO_2 and weighed. Insol. matter found is free C.
J. D. DAVIS

Note on the detection of carbon dioxide. G. ELTESTE. *Z. angew. Chem.* **41**, 1858(1928).—One difficulty concerning the detection of CO_2 from a leaky bomb or from a small quantity of carbonate is that the air always contains some CO_2. If filter paper is wet with 0.1 *N* $Ba(OH)_2$ contg. 1 cc. of 1% phenolphthalein per 10 cc., it will, while moist, be bleached by contact with more CO_2 than the air contains. Then if the paper is allowed to stand in the air, the color will slowly return. In the first case $Ba(HCO_3)_2$ is probably formed but on standing $BaCO_3$ results. W. T. H.

Remarks on my method of carbon dioxide analysis. H. LUNDEGÅRDH. *Z. Pflanzenernähr. Düngung. B.* **12A**, 1–4(1928).—Polemic between L. and Hasse and Kirchmeyer (*C. A.* **22**, 4698) over the method of detg. the CO_2 content of air.
R. M. BARNETTE

Answer to H. Lundegårdh's remarks on his method of carbon dioxide analysis. P. HASSE. *Z. Pflanzenernähr. Düngung. B.* **12A**, 4–7(1928).—Cf. preceding abstr.
R. M. BARNETTE

Analysis of gaseous mixtures containing carbon dioxide, carbon monoxide, hydrogen and methane. WILLIAM E. J. BROOM. *J. Soc. Chem. Ind.* **47**, 276–8T(1928).—With the aid of a Toepler pump and two gas-pipets, which are described, a mixt. of CO_2, CO and CH_4 can be analyzed accurately with small quantities of reagents. First the CO_2 is removed by 60% KOH soln. and then the gas is passed over CuO heated to 200–300° which, in the course of 90 min., oxidizes the H_2 to water and the CO to CO_2 without affecting the CH_4. The diminution in vol. thus gives the H_2 and after another absorption by KOH only CH_4 remains. W. T. H.

Determination of small quantities of acetic acid in air in presence of carbon dioxide. V. KUNI AND S. NIKOLSKI. *Gigiena truda* **1927**, 41–3.—The air is drawn through 0.1 *N* NaOH soln., the change in alky. is detd. and the carbonate pptd. as $BaCO_3$; the latter is detd. titrimetrically or as $BaSO_4$ B. C. A.

Differentiation between citric, tartaric and oxalic acids. D. I. PERIETZEANU. *Bull. soc. chim. Roumania* **10**, 49(1928).—Copper acetate gives with tartaric acid a ppt. of Cu tartrate difficultly sol. in dil. HCl and in 30% NaOH. Eight mg. of tartaric acid will give a ppt.; citric acid gives no ppt.; oxalic acid gives a ppt. of Cu oxalate insol. in 30% NaOH but sol. in an excess of concd. HCl. P. THOMASSET

new **process for estimating citric and tartaric acids.** F. PIRRONE. *Riv. ital.*

essenze e profumi. **1928,** 101-2.—Heat slowly to boiling in a 300–400-cc. flask 0.0500 g. tartaric acid or 0.0388 g. citric acid with 50 cc. 0.1 *N* KIO_3 and 25 cc. concd. H_2SO_4, evap. to 30 cc., cool, add 100 cc. distd. H_2O and evap. again to 30 cc. Cool again, add 100 cc. distd. H_2O and 10 cc. 30% KI, and titrate free I with 0.1 *N* $Na_2S_2O_3$. If *n* cc. $Na_2S_2O_3$ soln. is used, (50-*n*)0.00125 and (50-*n*)0.0009722, resp., are the quantities of tartaric acid or citric acid by wt. in the sample. R. SANSONE

The influence of the extract content on the determination of alcohol. ERICH WALTER. *Getränke-Ind.* **1927,** 285-6; *Chem. Zentr.* **1927,** II, 2428.—The quantities of ext. present influence the hydrometric detn. of small quantities of EtOH to such an extent that the results are inaccurate and misleading. Therefore it is advisable to det. the EtOH only after distn. C. C. DAVIS

Report on (the determination of) ether. G. C. SPENCER. Bur. of Chemistry and Soils. *J. Assoc. Official Agr. Chem.* **11,** 360-2(1928).—The Somogyi method (*C. A.* **20,** 1577) has been modified by passing the vapors through jacketed tubes, the 1st one (in which the alc. is absorbed) being maintained at 50° and the 2nd (in which the Et_2O is absorbed and oxidized) at 0°. The method was not found to be dependable for such mixts. as may be obtained by distn. from medicinal prepns., but it may give satisfactory results for known mixts. of anhyd. alc. and Et_2O. A. PAPINEAU-COUTURE

Critical remarks on the determination of glycerol by the acetin method and the sources of error. P. FUCHS. *Chem.-Ztg.* **52,** 737. O. BERTH. *Ibid;* cf. *C. A.* **21,** 2391; **22,** 3863.—The error sometimes attributed to acetylizable matter in the NaOH used is probably due, for the most part, to CO_2 absorbed by the NaOH; this influences the end point with phenolphthalein in the cold. F. shows at considerable length how proper allowance for this error can be made. B.'s method is to make an empirical correction. W. T. H.

Determination of the ortho position in certain phenolic compounds by color test. FRITZ WISCHO. Univ Graz. *Pharm Monatshefte* **9,** 169-71(1928).—Color reactions have been studied and results tabulated when solns. of pyrocatechol, adrenaline, pyrocatechuic acid, gallic acid, pyrogallol, tannin, apomorphine, guaiacol, salicylic acid, saligenin and anthrarobin are treated with $FeCl_3$, Jorrison's reagent, aq NH_4 vanadate, and V_2O_5 in dil. HCl, H_3PO_4 and $H_2C_2O_4$, resp While positive results with the V reagents may be obtained on unknowns, they should be considered only as aids in detecting *o*-phenolic compds. Resorcinol, quinol, orcinol and phloroglucinol do not respond to the V reagent. W. O. E

Color tests for simple sugars. SAN-YIN WONG. Univ. Hongkong. *Chinese J Physiol* **2,** 255-8(1928).—The α-naphthol, resorcinol, phloroglucinol and orcinol tests for sugars gave more delicate results if the reagent was dissolved in glacial AcOH and the test was made in an AcOH medium. Moreover, the resultant color remained clear and could be used for spectroscopic examn. or color comparison L. W. RIGGS

Color reactions of the carbohydrates. LAD. EKKERT. Univ. Budapest. *Pharm. Zentralhalle* **69,** 597-600(1928); cf. *C. A.* **21,** 875, 4018.—A study of the colors produced by the interaction of the carbohydrate (arabinose, xylose, rhamnose, glucose, mannose, galactose, fructose, sucrose, lactose, maltose, dextrin, glycogen and amylum soluble) 0.005 to 0.01 g. with an equal amt. of phenol (resorcinol, α-naphthol, β-naphthol, morphine, codeine, phenacetin, α-naphthylamine), and 1 cc. concd. H_2SO_4. The colors develop slowly at room temp. but more rapidly on careful warming. W. O. E

Rapid method of glucose determination. W. D. HORNE. *Planter Sugar Mfr* **81,** 1(1928).—A modification of the well-known cyanide method using Rice's expended Meissl-Hiller table. The alk. Cu soln. after boiling is made immediately to vol. without cooling and an aliquot pipetted for titration with standard KCN soln. The pipet used is graduated especially to facilitate correction and compensation for temp. J. F. BREWSTER

Estimation of reducing sugars. WM. L. O. WHALEY. *Planter Sugar Mfr.* **80,** 41-4(1928).—With either Fehling, Violette or Soxhlet alk. Cu soln., carefully standardized, the method offers the novel feature of titration without the use of outside or added indicator, the flocculated appearance and color of the pptd. Cu_2O serving to indicate the end point. A table is included giving buret readings corresponding to wts. of reducing sugars. J. F. BREWSTER

Determination of atropine in the presence of morphine. L. E. WARREN. U. S. Food, Drug and Insecticide Administration. Washington, D. C. *J. Assoc. Official Agr. Chem.* **11,** 377-81(1928).—In the U. S. P. method for detg. codeine sulfate in morphine sulfate, the morphine is fixed with excess NaOH and the liberated codeine is shaken out with $CHCl_3$. This method is inapplicable as such for detg. atropine, scopolamine, or other solanaceous alkaloids, in the presence of morphine, because most com. mor-

phine salts contain notable proportions of codeine salts as impurities which would contaminate the extd. solanaceous alkaloid. W. suggests a method (technic described in detail) consisting in sepg. the total alkaloids into 2 fractions, one contg. morphine only and the other the total alkaloids not morphine, by the U. S. P. method for detg. codeine in morphine sulfate, then destroying the atropine in the total alkaloids not morphine by the Fuller method, detg. the total remaining alkaloids, and estimating the atropine by difference. Use of the method showed that experienced analysts familiar with the technic can obtain results within about 10% of the truth, while inexperienced analysts are apt to fail. Moreover the method is long and time-consuming.
A. PAPINEAU-COUTURE

Determination of H-ion concentration in the tannery (KÖHLER) **29.** Speiss and the metals of the Pt group (RUSDEN, HENDERSON) **9.** Determination of turpentine vapors in air (BOGATSKII, BIBER) **26.** The titrimetric determination of acids and bases in various solvents (LINDERSTRÖM-LANG) **2.** Reflection in complex systems (POKROVSKII) **2.** New indicator for Cl (ALFTHAN, JARVIS) **14.** Preparation of the *o*-tolidine reagent for free Cl (BORUFF, *et al.*) **14.** Action of phenylhydrazine on oxides and salts of metals (determination of Hg in $HgCl_2$ and in HgCl) (PUXEDDO) **6.** The determination of loss of organic solvents on extraction of water solutions (WEINDEL) **21.** The use of Stolte's ashing method in microanalysis (EGG, KLINKE) **11B.** Colorimetry (ECKSTEIN) **2.** A rapid method for determining organically bound I (PFEIFFER) **11B.**

SCHUNTERMANN, KARL ERICH: **Chemische und mikrochemische Untersuchungsmethoden.** München: Verlag d. Ärztl. Rundschau. O. Gmelin. 174 pp. M. 5; bound, M. 6.50.

Detecting carbon monoxide. EDGAR W. HULTMAN. U. S. 1,684,587, Sept. 18. Test papers are employed contg. $PdCl_2$ and a hygroscopic salt such as $CaCl_2$ to keep the papers moist.

Determination of moisture in powders. T. S. BONVECH. Russ. 3747, Oct. 31, 1927. The finely powdered material is weighed and mixed with an equal wt. of CaC_2. The temperature increase indicates the amt. of water. Tables must be calcd. beforehand for each material showing the increase in temp. for a given amt. of moisture.

8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY AND J. F. SCHAIRER

The atomic volume relations in certain isomorphous series. II. A. F. HALLIMOND. *Mineralog. Mag.* **21**, 480–4(1928); cf. *C. A.* **22**, 189.—The isomorphous replacement of one element by another in a pair of cryst. salts is generally accompanied by a change in the mol. vol. The present contribution deals with the vol. relations of salts of Ca, Sr and Ba with O, S, Se and Te, and it is shown that these relations correspond with those for K, Rb and Cs with the halogens. The effect of substitution in the NaCl lattice varies with the size of the cell but the variation does not attain the proportion required for a law of const. radii. The results obtained might be expressed as showing minor deviations from the law of Retgers where mol. vol. is additive in a series of isomorphous mixts.
W. F. HUNT

Mineralogical communications. K. JOHANSSON. Reichmuseum, Stockholm. *Z. Krist.* **68**, 87–118(1928).—*Gudmundite* is a new mineral belonging to the marcasite group. It resembles arsenopyrite in phys. properties and crystn. Analysis gave: Fe 26.79, Ni trace, Sb 57.31, S 15.47, Sn 99.57%, corresponding to FeSbS. The axial ratio is 0.6729:1:1.1868. *Haematophanite* is a new mineral with the following compn.: PbO 73.26, FeO 0.22, MnO 0.29, CaO 0.26, MgO 0.06, K_2O 0.17, Na_2O 0.38, Fe_2O_3 22.01, $FeTiO_3$ 0.20, Cl_2 2.17, H_2O 0.73, insol. 0.42, sum 100.17, corresponding to the formula $Pb(Cl,OH)_2{\cdot}4PbO{\cdot}2Fe_2O_3$. It occurs singly or in aggregates of platy crystals, with a mica-like cleavage, color dark red-brown, streak yellowish red, hardness 2–3; sp. gr. 7.70, uniaxial—. Analyses and crystallographic descriptions are also given for *plumboferrite* ($PbO{\cdot}2Fe_2O_3$) and *jacobsite* $(Mg,Mn)Fe_2O_4$. X-ray data are included, with the following conclusions [for which insufficient data are given. ABSTRACTOR]: 42 (?) mols. of plumboferrite in a hexagonal cell with a = 11.86 and c = 47.14 A. U., 3 (?) mols. of haematophanite in a tetragonal cell with a = 7.801 and c = 15.23 A. U. Jacobsite is cubic, with a = 8.42 A. U., and has a spinel type of structure, with the lower symmetry O_4 because of the partial replacement of Mn by Mg. Descriptions

and analyses are also given for a *manganomagnetite* and an *andradite garnet*.
L. S. RAMSDELL

Spectral analysis of minerals. F. LÖWE. *Neues Jahrb. Min. Abt. A, Beil.-Bd.* **55**, 291–8(1926–7); cf. *C. A.* **22**, 44.—The use of the quartz spectrograph in mineralogical studies is described. J. F. SCHAIRER

The spectroscopic detection of minute amounts of impurities in minerals. G. O. WILD. *Neues Jahrb. Min. Abt. A, Beil.-Bd.* **55**, 488–508(1926–7). J. F. S.

The minerals of the Chibina and Lujavr tundras on the Kola peninsula. A. E. FERSMAN. *Neues Jahrb. Min. Abt. A, Beil.-Bd.* **55**, 36–46(1926–7); *Am. Min.* **11**, 289–99(1926).—Analyses of calcio-ancylite, cerapatite, ussingite, pectolite, eudialyte, eucolite, yuksporite, lamprophyllite, aenigmatite, mangan-neptunite, ramsayite, murmanite, rinkolite, lovtschorrite, loparite, astrophyllite, ranite and titanite are given with data on their origin and occurrence (cf. *C. A.* **19**, 2011). J. F. SCHAIRER

Supplement to the knowledge of the minerals of Jugoslavia. FRAN TUĆAN. *Ann. Géol. Pénins. Balkan* **9**, 77–83(1927); *Mineralog. Abstracts* **3**, 541.—Descriptions with chem. analyses are given of: asphalt (sp. gr. 1.890) from Prugova, Dalmatia; quartz sand from Perna, Croatia; ocher from Rudine, Croatia; and tetrahedrite from Mracaj, Bosnia. J. F. SCHAIRER

New Saxony mineral occurrences. A. TETZNER AND F. EDELMANN. *Jahrb. Berg und Hüttenw. Sachsen* **100A**, 49–72(1926); **101A**, 70–122(1927); *Mineralog. Abstracts* **3**, 539.—Notes to supplement Frenzel's book on the minerals of Saxony (1874). *Normannite* is a name left in manuscript in the Freiburg collection by A. Weisbach for a basic bismuth carbonate, $3Bi_2O_3.CO_2$, occurring as brown globular aggregates in the Wolfgang Maassen mine at Neustädtel near Schneeberg.
J. F. SCHAIRER

Appendix to the "Mineralogical Tables" of P. Groth and K. Mieleitner for the years 1921–7. New mineral names. WALTHER FISCHER. *Sitzungsber. Abhandl. Naturwiss. Gesell. Isis, Dresden*, **1928**, Festschrift Richard Baldauf, pp. 1–19; *Mineralog. Abstracts* **3**, 469.—An alphabetical list giving each mineral, its chem. formula, crystal system and bibliographical reference. J. F. SCHAIRER

The question of monoclinic diaspore. I. I. TANATAR. *Bull. Geol.-Min. Circle, Dnepropetrovsk Mining Inst.* p. 9, **1927**; *Mineralog. Abstracts* **3**, 473.—Errors in the optical description of the "monoclinic diaspore" (to which the name *tantarite* has been given) are pointed out. The monoclinic symmetry of the mineral has been confirmed.
J. F. SCHAIRER

Allochromism, morphotropism and structure of a mineral, especially precious stones. R. KLEMM. *Fortschritte Mineral. Kryst. Petrog.* **12**, 47–8(1927).—A brief discussion of the structure and coloring materials of minerals and gem stones. J. F. S.

The so-called emerald triplets from Muzo and their optical anomalies. F. BERNAUER. *Neues Jahrb. Min. Abt. A, Beil.-Bd.* **54**, 205–42(1926).—Emeralds from Muzo, Columbia, show a hexagonal core surrounded by 6 sections with fibrous structure. The sectors are sometimes separated by carbonaceous inclusions. Approx. chem. analyses are given. D. = 2.648–2.709. Optical properties are given. Some tiny artificial crystals show a similar structure. J. F. SCHAIRER

Chemistry of garnets. FRANZ HERITSCH. *Neues Jahrb. Min. Abt. A, Beil.-Bd.* **55**, 60–91(1926–7).—Ninety-five published analyses of garnet are recalcd. to mol. % of the individual garnet mols. and arranged in groups according to compn. The compns. are plotted on triangular diagrams showing the degree of miscibility of the several mols. The relation of the garnets to rock types is discussed. J. F. S.

Mineralogical synthetic studies of sapphires (sapphirin). E. DITTLER. Univ. Wien. *Z. anorg. allgem. Chem.* **174**, 342–54(1928); cf. *C. A.* **22**, 3363.—The H_2O content varies from 0.31 to 1.60%. The analysis of sapphirin from Vol Codera (on a hygroscopic H_2O-free basis, ex. 100°) is: SiO_2 15.21, TiO_2 0.25, Al_2O_3 61.76, FeO 4.32, MnO 0.12, CaO 0.49, MgO 16.25, H_2O + 1.60%. No B was found. The mineral decomposes before fusion occurs. The mineral fuses at 1580 ± 5° to a greenish mass. A phase-rule diagram, showing the regions of occurrence of cordierite, sillimanite, spinel, corundum and periclase, is given. The compn. of 6 minerals is included.
J. H. P.

The crystal structure of topaz. LINUS PAULING. Calif. Inst. Tech. *Proc. Nat. Acad. Sci.* **14**, 603–6(1928); cf. Leonhardt, *C. A.* **18**, 648.—By making use of the coördination theory of ionic crystals, a structure for topaz was derived which agreed satisfactorily with the exptl. data. The fundamental polyhedra for topaz were assumed to be an octahedron of anions (O and F) about each Al ion and a tetrahedron of O ions about each Si ion. The anion-anion distance detg. the length of a polyhedron edge

was taken to be 2.72 A. U. throughout. By piling these polyhedra together one struture was found, the unit of which approximated that observed for topaz.

L. W. RIGGS

Synthetic turquois. M. K. HOFFMANN. *Fortschritte Mineral. Kryst. Petrog.* **12,** 45(1927).—Synthetic *turquois* was made by heating to 100° a very finely powdered mixture of malachite ($^1/_2$ mol.), $Al(OH)_3$ (6 mols.) and concd. phosphoric acid (2 mols.). Turquois decomposes into CuO and other products above 200°. J. F. SCHAIRER

Alumohydrocalcite—a new species. G. A. BILIBIN. *Mém. Soc. Russe Min.* [2], **55,** 243–8(1926)(English Summary); *Mineralog. Abstracts* **3,** 472.—A mineral called *alumohydrocalcite* was found in the Khakassky district, Siberia. It has the appearance of chalk, is brittle, sp. gr. 2.231. Analyses give the formula $CaO.Al_2O_3.2CO_2.5H_2O$. It is readily sol. in acids. Boiling H_2O causes sepn. of $CaCO_3$ and $Al(OH)_3$. It consists of microscopic radially-fibrous spherulites. $\alpha = 1.485$, $\beta = 1.553$, $\gamma = 1.570$, $2V = 50–55°$, optically negative. The dehydration curve shows breaks at 180–190°, 350° and less distinctly at 740–800°. The formula is written $CaH_2(CO_3)_2.2Al(OH)_3.H_2O$ analogous to that of dundasite. The mineral is related to dawsonite and hovite. It appears to have been formed by the action of $CaH_2(CO_3)_2$ on allophane. Attempts to prepare it artificially were unsuccessful. J. F. SCHAIRER

Bodenbenderite, a new mineral from Argentina. E. RIMANN. *Sitzungsber. Abhandl. Naturwiss. Gesell. Isis, Dresden,* **1928,** Festschrift Richard Baldauf, 42–51; *Mineralog. Abstracts* **3,** 472.—Albite-fluorite veins in the Sierra Chica, Sierra de Cordoba contain penninite, mica, helvite, garnet, vesuvianite and a new garnet-like mineral called *bodenbenderite.* The new mineral occurs as flesh-red dodecahedra. It is optically isotropic with an index of refraction greater than 1.77; sp. gr. 3.3–3.5; H = 6–6.5; fuses to a black slaggy glass. A complete analysis is given. After deducting 16.7% of impurities the analysis gives the formula $4RO.R_2O_3.3RO_2$ or $(Mn, Ca)_4Al[(Al,Yt)O][(Si,Ti)O_4]_3$ which is compared with that of beckelite. The compn. is also expressed as a mixt. of plazolite and vesuvianite. J. F. SCHAIRER

Kolbeckite, a new mineral from Saxony. F. EDELMANN. *Jahrb. Berg und Hüttenw. Sachsen* **100A,** 74–5(1926); *Mineralog. Abstracts* **3,** 472.—In a quartz-wolframite vein in the Sadisdorf Cu mine near Schmiedeberg were found a few cyan-blue to blue gray crystals with a pearly luster. Sp. gr. 2.39; H 3.5–4; monoclinic twinned on (100) with an orthorhombic habit, cleavage (010), strong pleochroism. The mineral, called *kolbeckite,* is difficultly sol. in acids and contains much Be with P_2O_5, SiO_2, little Al and Mg, traces of Cu, Fe and SO_3. It appears to be a phosphate or silico-phosphate of Be. J. F. SCHAIRER

A new platinum mineral in the Rustenburg norites. R. A. COOPER. *J. Chem. Met. Mining Soc. S. Africa* **28,** 281–3(1928).—The compd. secured from platiniferous norites was almost completely insol. in aqua regia and assayed: Pt 64.2, Pd 9.4, S 17.7, As 7.7%. The presence of Pd is probably due to the difficulty of making a clean sepn. The insol. Pt in the output from the Onverwacht dunite deposit is a sulfarsenide of the following compn.: Pt 59.3, S 3.7, As 36.9%. The new sulfarsenide possesses a more grayish steely color than sperrylite ($Pt\ As_2$) and is usually in irregular fragments or very complex cryst. forms with occasional elongated rectangular rods.

W. H. BOYNTON

Andorite from Felsobanya. S. KOCH. *Ann. Hist. Nat. Musei Nationalis Hungarici* **23,** 263–71, 271–2(1926); *Mineralog. Abstracts* **3,** 506; cf. *C. A.* **22,** 2903.

J. F. SCHAIRER

Barite deposits in the vicinity of Gado siding, Givelo district. F. E. KEEP. *S. Rhodesia Geol. Surv. Short Report* No. **22,** 7 pp.(1927); *Mineralog. Abstracts* **3,** 490.—Very pure deposits of $BaSO_4$ occur in felsitic schists in lenses parallel to the foliation. At least 100,000 tons of high-grade barite exist within a depth of 15 ft. from the outcrops. J. F. SCHAIRER

Anchi-stoichiometric types of biotite granite arranged according to their theoretical feldspar mixtures. PETER CHIRVINSKII. *Neues Jahrb. Min. Abt. A, Beil.-Bd.* **53,** 209–28(1926); cf. *C. A.* **20,** 1045.—C. has calcd. the chem. compn. of feldspars from available analyses of biotite granite and arranged a classification of these granites according to the compn. of their feldspars. J. F. SCHAIRER

The fine structure and physical behavior of brookite, and the change of state of the three natural forms of titania. ALFRED SCHRÖDER. *Z. Krist.* **67,** 485–542(1928).—A detailed discussion of data previously presented in brief form (cf. *C. A.* **22,** 2341). Additional data concerning variations in *n,* expansion and d. with change in temp. are included. Twenty-nine references are given. L. S. RAMSDELL

New investigations on the system: aluminum oxide–silicon oxide. WILHELM

EITEL. *Ber. deut. keram. Gesell.* **7,** 348–50(1926).—According to Bowen and Greig (*C. A.* **18,** 2587) mullite and sillimanite are similar in many properties but differed in compn. and thermal behavior. H. Mark (*C. A.* **21,** 3145) and P. Rosland, as a result of x-ray investigations, claim that mullite really consists of minute crystals of corundum in a fine threaded grating of sillimanite. From a mineralogical point of view the existence of mullite as an individual species could not be maintained. Just how the corundum and sillimanite are mixed is still a question but it is possible that the excess alumina is combined with the sillimanite in solid soln., or alumina in colloidal form may be entangled in the crystal structure of sillimanite. H. G. SCHURECHT

The brucite and hydromagnesite of a new deposit in the Urals. N. IGNATIEV. *Cr. Acad. Sciences de L'Urss* **1926,** 132–5; *Chem. Zentr.* **1927,** II, 797.—Brucite with hydromagnesite, calcite and serpentine were found in magnesite pieces at Satka in the Ural. The first mineral has the compn. 0.06 SiO_2, 0.21 Al_2O_3, 0.09 Fe_2O_3, 0.58 FeO, 66.71 MgO, 1.36 CaO, 2.95 CO_2 and 28.91 H_2O, and forms a compact aggregate with leafy texture, while the hydromagnesite covers the brucite in a crust-like form. The hardness of the brucite is 2.5 and d_{17} = 2.391. It forms uniaxial, optically positive platelets with ω = 1.5577 and ϵ = 1.5811. G. SCHWOCH

The structure of β-corundum. C. GOTTFRIED. *Fortschritte Mineral. Kryst Petrog.* **12,** 34–5(1928); cf. *C. A.* **22,** 2088.—A preliminary examn. by x-rays of β-corundum gave *n* 1.68, d. 3.30 and O at. vol. 17.25 cubic A. U. as against 1.768 and 14.05 for α-corundum, pointing to a closely packed arrangement for the latter and an open structure for the β-modification. The Laue diagram shows a hexagonal axis with 6 planes of symmetry. The unit cell has the dimensions a = 5.63, c = 22.63 A. U. (c/a = 4.02) and contains 12 mols. of Al_2O_3. J. F. SCHAIRER

Gem corundum. R. KLEMM AND G. O. WILD. *Neues Jahrb. Min. Abt. A, Beil.-Bd.* **53,** 266–70(1926).—A brief discussion of the coloring materials of the corundum gem stones. J. F. SCHAIRER

Etch and solution figures on corundum. M. SEEBACH. *Neues Jahrb. Min Abt. A, Beil.-Bd.* **54,** 420–43(1926).—Artificial corundum (polished spheres) was etched in fused $KHSO_4$ for different lengths of time. The indices of the solution forms are compared with those of the growth forms. J. F. SCHAIRER

Chemical analysis of the epsomite from the schists of the Zahořany horizon on the Letna. RUDOLF ZIRKOVSKÝ. *Časopis Narodniho Musea, Prague* **102,** 59–60(1928); *Mineralog. Abstracts* **3,** 546.—The schists near Prague are often coated with a white efflorescence, used for medicinal purposes in the 18th century. An analysis gave SO_3 28.10, MgO 13.63, CaO 0.52, insol. 15.58, H_2O [42.17] with traces of Fe, Al and alkalies. J. F. SCHAIRER

Some new curves for the determination of feldspars by the method of Fedorov. HENRI SIGG AND GEORGES FAVRE. *Bull. Soc. Vaud. Sci. Nat.* **51,** 341–80(1917); *Mineralog. Abstracts* **3,** 515.—From a revision of existing data on plagioclase twins the authors infer that the pericline law is not the only one in which the plane of association varies with the chem. compn. of the feldspar. This has been adversely criticized by Sabot (cf. following abstr.). J. F. SCHAIRER

The Fedorov method and its application to the determination of feldspars. R. SABOT. *Compt. rend. soc. phys. hist. nat. Genève* **35,** 72–6(1918); *Mineralog. Abstracts* **3,** 515.—The influence of a triclinic $KAlSi_3O_8$ on the optical consts. of the plagioclases was studied. The variation of the twin plane in Carlsbad and Esterel-Ala twins was detd. Fine twin-lamellae parallel to ($\bar{1}$10) and (110) were observed. In normal hemitropes no variation is found in the position of the twin plane. The explanation of these variations as due to vicinal faces (Sigg and Favre) is not accepted. J. F. SCHAIRER

Laue diagram of fluorite. HANS CLAUSEN. *Meddel. Dansk. geol. For.* **7,** 40 (1926); *Chem. Zentr.* **1927,** II, 1927.—The intensity relations of a Laue diagram of fluorite on (100) agreed with the structure found by Bragg. C. C. DAVIS

The identification of dumortierite as grains; dumortierite in Cornish granite. A. W. GROVES. *Mineralog. Mag.* **21,** 489–92(1928).—In the study of heavy mineral grains some confusion may arise between dumortierite and tourmaline, glaucophane, andalusite, sillimanite and lepidolite. The sign of elongation and character of pleochroism are important in making distinctions. Dumortierite was found in the sediments of southern England and in the granite of Land's End, Cornwall. W. F. H.

Glauconite from Lyssaja Gora at Saratov. P. PILIPENKO. *Wiss. Verhandl. Staatsuniv. Saratov* **5,** 255–65(1926); *Chem. Zentr.* **1927,** II, 1937.—The glauconite is obtained by elutriation of a chalk marl from Lyssaja Gora, of which it comprises about 45%. It contains 5.02–5.49% H_2O (above 110°). Treatment with concd

HCl forms quartz pseudomorphs. Analyses showed a compn. of $2.5R_2'O.R_2''O.2R_2'''.0.8SiO_2.4H_2O$, where R' = K, Na, H and Li, R'' = Ca and Mg and R''' = Al and Fe. C. C. DAVIS

A variety of gypsum from the island of Vulcano containing barium and strontium. G. CAROBBI. *Ann. R. Osservatorio Vesuviano* [3], **2**, 125–6(1925); *Mineralog. Abstracts* **3**, 551.—Among the abundant crusts in the "Grotta Piccola dell' Allume" on Vulcano, Lipari Islands are colorless crystals of gypsum which gave on analysis: SO_3 46.70, BaO 0.07, SrO trace, H_2O 20.68. C. suggests that $BaSO_4.2H_2O$ and $SrSO_4.2H_2O$ may exist in a very limited amt. in mixed crystals with $CaSO_4.2H_2O$. J. F. SCHAIRER

Hatchettine and valaite in the Silurian of Bohemia. JOSEF ŠPAČEK. *Sbornik prirodovedecky, Prague* **4**, 43–56(1927); *Mineralog. Abstracts* **3**, 547.—The hatchettine and valaite have been derived from naphtha which is still present in small amts. and is evidently of animal origin. Diabases near these beds often contain a kind of coal supposed to be "petroleum coke" and formed by the igneous intrusion into the Carbonaceous beds. J. F. SCHAIRER

Hypersthene-andesite from Nagyhegy. MARIA VENDL. *Ann. Hist.-Nat. Musei Nationalis Hungarici* **23**, 169–73, 173–7(1926); *Mineralog. Abstracts* **3**, 498.—The pyroxene-andesite contains porphyritic plagioclase and hypersthene. The latter is present as well formed crystals. In the groundmass of the rock consisting of plagioclase, apatite, magnetite, there are small cavities with minute tabular crystals of tridymite and prismatic crystals of amphibole. A chem. analysis of the rock is given. The SiO_2 (65.32%) is higher than in other Hungarian pyroxene-andesites and is near some of those from the Sierra Nevada in Calif. J. F. SCHAIRER

Two Bohemian minerals of the jarosite group. RUDOLF JIRKOVSKÝ. *Časopis Národního Musea, Prague* **101**, 151–5(1927); *Mineralog. Abstracts* **3**, 546.—An analysis of a yellow crust from Kopeč shows the highest degree of miscibility of the jarosite and alunite molecules (nearly 1:1) yet observed in this group. Natrojarosite occurs at Valdice near Kostalov. J. F. SCHAIRER

A new occurrence of kaolinite in Northumberland. S. J. TOMKEIEFF. *The Vasculum, Newcastle-upon-Tyne* **11**, 72–4(1925). **Occurrence and mode of origin of certain kaolinite-bearing nodules in the Coal Measures.** S. J. TOMKEIEFF. *Proc. Geol. Assoc. London* **38**, 518–47(1927); *Mineralog. Abstracts* **3**, 444.—Ironstone nodules in shale at Cow Gate have the cracks of the nodule filled with kaolinite and calcite. Chem. analysis after deduction of Fe_2O_3 and CO_2 gave SiO_2 46.89, Al_2O_3 39.30, H_2O 13.81. A detailed chem. and mineralog. study of the nodules and shale has been made and the author discusses the origin of the kaolinite and formation of concretions at length. J. F. SCHAIRER

Löllingite from the pegmatite of Dolni Bory. JOSEF VYSLOUŽIL. *Příroda, Brno* **21**, 81(1928); *Mineralog. Abstracts* **3**, 548.—An analysis of lollingite gave Fe 27.83, As 73.36, S 1.46, insol. 0.17, sum 100.82. J. F. SCHAIRER

Observations on magnetite, ilmenite, hematite and their relation to the system FeO-Fe_2O_3-TiO_2. PAUL RAMDOHR. *Neues Jahrb. Min. Abt. A, Beil.-Bd.* **54**, 320–79 (1926).—From a microscopic and chemical study of natural minerals some data were accumulated on the systems Fe_2O_3–Fe_3O_4, Fe_3O_4–$FeTiO_3$, $FeTiO_3$–Fe_2O_3, $FeTiO_3$–TiO_2, Fe_2O_3–TiO_2 and Fe_3O_4–TiO_2. Analyses of ilmenite are included. J. F. S.

Veins of magnetite in the Valle di Peio near Fucine, Trento. B. LOTTI. *Rass. min. met. ital.* **68**, 69–70(1928).—The cryst. schist which dominates the Peio valley is composed of gneiss, mica-schist, pegmatite, amphibolite, limestone and lime schist and is part of a granitic mass. In fracture cleavages of the limestone and schists are deposits of magnetite, pyrite and pyrrhotite in a matrix of quartz and ferrocalciferous silicates. C. C. DAVIS

Fluorite veins in the Black Forest. M. HENGLEIN. *Steinindustrie* **1927**, 54; *Chem. Zentr.* **1927**, II, 1938.—A description of fluorite veins in Kinzigtal, Ödsbachtal Hesselbachtal and near Grumbach. C. C. DAVIS

The structure of the phenacite–dioptase group. C. GOTTFRIED. *Neues Jahrb. Min. Abt. A, Beil.-Bd.* **55**, 393–400(1926–7).—The elementary cell of phenacite has the dimensions a = 12.49, c = 8.26 A. U.; for willemite a = 14.14, c = 9.58 A. U.; for troostite a = 14.21, c = 9.62 A. U. An analysis of troostite is given. Dioptase gave the dimensions a = 14.66, c = 7.83 A. U., and is isomorphous with the other members of the phenacite group studied. J. F. SCHAIRER

The first occurrence of pisanite in Hungary. GABRIEL VAVRINECZ. *Magyar Chemiai Folyoirat* **32**, 88–95(1927); *Mineralog. Abstracts* **3**, 504; cf. *C. A.* **22**, 2126. J. F. SCHAIRER

Some properties of plagioclases. MARCEL GYSIN. *Compt. rend. soc. phys.*

hist. nat. Genève **39,** 70–3(1922); *Mineralog. Abstracts* **3,** 517.—G. has studied the variations in chem. compn. of plagioclase phenocrysts and microlites in different rocks. J. F. SCHAIRER

Pseudogaylussite. J. VAN BAREN. *Mededeelingen van het geologisch Instituut der Landbouwhoogeschool, Wageningen* No. **10,** 25 pp.(1926); *Mineralog. Abstracts* **3,** 485.—A detailed review of the literature on *pseudogaylussite* is given. Objects imbedded in clay from near Avenhorn consist of calcite rhombohedra with grains of glauconite, epidote, quartz and iron sulfide and diatoms. An analysis showed 93.25% $CaCO_3$. These objects are of concretionary origin. J. F. SCHAIRER

Analysis of pseudopite from Borostyankő. GABRIEL VAVRINECZ. *Magyar Chemiai Folyoirat* **33,** 185–7(1927); *Mineralog. Abstracts* **3,** 505.—Three analyses are given. J. F. SCHAIRER

Types of Hungarian rhyolite. ALADAR VENDL. *Neues Jahrb. Min. Abt. A, Beil.-Bd.* **55,** 183–249(1926–7).—Analyses of rhyolites, rhyolite pitchstone, felsitic rhyolite, glassy rhyolite, perlite and obsidian are given. J. F. SCHAIRER

The optical properties of rinneite. C. W. CHENG. *Fortschritte Mineral. Kryst. Petrog.* **12,** 21(1927).—Optical data are recorded for rinneite. J. F. SCHAIRER

Sphalerite from Mantova near Chotěšov. FRANTIŠEK ULRICH AND VACLAV VESELY. *Věstnik Statniho Geol. Ustavu Československé Republiky* **3,** 32–5(1927); *Mineralog. Abstracts* **3,** 547.—An analysis of sphalerite from the Masaryk coal mine at Mantova yields the formula 9 ZnS.FeS, sp. gr. 4.03. J. F. SCHAIRER

New strontium mineral from the bauxite deposit in Tikhvin district, Russia. O. M. ANSHELES. *Mem. Soc. Russe Min.* [2], **56,** 53–60(1927)(English Summary); *Mineralog. Abstracts* **3,** 473.—A mineral named *tikhvinite* occurs as almond-shaped bodies, 5 mm. across, sp. gr. 3.32, n = 1.62, optically anisotropic, insol. in acids. Analysis gives formula $2SrO.3Al_2O_3.P_2O_5.SO_3.6$ or $7H_2O$. The mineral is near svanbergite and harttite in compn. J. F. SCHAIRER

Wiikite. LAURI LOKKA. *Bull. Comm. Geol. Finlande* No. **82,** 68 pp.(1928).—In 1895 Ramsay gave the name wiikite to the yellow variety of a "euxenit-like" mineral. L. has made a complete study of the occurrence, crystallography, chem. compn., phys. properties and radioactivity of *wiikite*. Complete analytical directions are given for the detn. of a mineral contg. Cb_2O_5, Ta_2O_5, TiO_2, SiO_2, ZrO_2, ThO_2, UO_2, Y_2O_3, Ce_2O_3, Al_2O_3, Fe_2O_3, FeO, MnO, PbO, MgO, CaO, S, H_2O. Complete analyses of wiikite from Hunttila, Lokansaari and Nuolainniemi are given. L. concludes that wiikite and samarskite are isomorphous. The age of the wiikite calcd. from the U, Th and Pb ratios varies from 401 to 2527 million years. The material from Nuolainniemi was found (microscopically) to consist of two different substances—much black opaque cryst. material and an isotropic colorless substance. To this mixt. L. gives the name *nuolaite*. Nuolaite is almost free from UO_2 but is rich in ThO_2. J. F. SCHAIRER

X-ray studies of zunyite. B. GOSSNER. *Neues Jahrb. Min. Abt. A, Beil.-Bd.* **55,** 319–32(1926–7).—The elementary cell contains 6 molecules of $3SiO_2.3AlO(F,Cl).4AlO_2H.2AlO_3H_3$. a = 13.92 A. U. (mean value). Rotating crystal, powder and Laue methods were used. J. F. SCHAIRER

Study of feldspar twins by the Fedorov method. ELVIRA CARRASCO. *Bull. Soc. Vaud. Sci. Nat.* **52,** 483–564(1920); *Mineralog. Abstracts* **3,** 516.—Tabulated measurements made on 37 feldspars in rocks are given. Departures from Michel Levy's curve connecting the optic axial angle with the chem. compn. of plagioclase are found. J. F. SCHAIRER

Manebach, Ala and complex twins: study of extinction angles on oriented sections. HENRI SIGG AND ELVIRA CARRASCO. *Bull. Soc. Vaud. Sci. Nat.* **52,** 219–23(1919); *Mineralog. Abstracts* **3,** 516.—Data are given in four tables for the extinction in oriented sections of 7 plagioclases of known chem. compn. and of the corresponding individuals in various twins. J. F. SCHAIRER

Magmatic reactions. E. LEHMANN. *Neues Jahrb. Min. Abt. A, Beil.-Bd.* **54,** 165–294(1926).—A discussion of chem. reactions during differentiation, with many examples and equations showing the chem. changes. J. F. SCHAIRER

The structure of aluminum silicates of the type Al_2SiO_5 and of pseudobrookite. H. MARK AND P. ROSBAUD. *Neues Jahrb. Min. Abt. A, Beil-Bd.* **54,** 127–64(1926).—By the rotating crystal x-ray method the following data were obtained: cyanite a 7.18, b 8.00, c 5.55 A. U.; andalusite a = 7.90, b 7.90, c 5.5 A. U.; sillimanite a 7.25, b 7.65, c 5.88 A. U.; artificial fibrous mullite c = 2.94 A. U. (half that of sillimanite). From the data on mullite the compn. must be $2Al_2SiO_5$ or Al_2SiO_5 (not $3Al_2O_3.2SiO_2$). Pseudobrookite gave a 9.78, b 9.80, c 3.65 A. U. with 4 mols. of Fe_2TiO_5. It is isomorphous with andalusite. J. F. SCHAIRER

The necessity of a physicochemical study of the reaction: $2CaCO_3 + MgSO_4 \rightleftharpoons CaCO_3.MgCO_3 + CaSO_4$. B. P. Krotov. Univ. of Kassan. *Ann. inst. anal. phys.-chim.* (*Leningrad*) **3**, 662–82; *Chem. Zentr.* **1927**, II, 2659–60.—The Haidinger reaction: $2CaCO_3 + MgSO_4 \rightleftharpoons CaCO_3.MgCO_3 + CaSO_4$, is probably capable of explaining numerous geologic phenomena. Thus dolomites are probably formed by this reaction, the equil. being displaced toward the right because $CaSO_4$ is insol. in concd. $MgSO_4$ solns. On evapn. of sea water the high concn. of $MgSO_4$ is reached only when the soln. is already satd. with NaCl. It was therefore to be expected that dolomites would ordinarily contain NaCl as an impurity, a supposition that was verified by numerous tests. The insol. $CaSO_4$ formed at the same time as the dolomite likewise was found very frequently. This assocn. would make possible the reverse transformation to $CaCO_3$ and $MgSO_4$ under the influence of ground water contg. no $MgSO_4$. That dolomite and gypsum (or anhydrite) can nevertheless exist together is probably to be explained by the fact that ground water contains considerable NaCl, and NaCl inhibits, according to Haidinger, the course of the reaction from right to left. The Haidinger reaction also plays a part in the drying up of seas contg. $MgSO_4$, when the soil consists of limestone. In this way may also be explained the fact that the Stassfurt deposits contain less $MgSO_4$ than that which should correspond to their origin from sea water. C. C. Davis

Scientific expedition to Karabugaz in the years 1921–1923. N. I. Podkopaev. *Ann. inst. anal. phys.-chim.* (*Leningrad*) **3**, No. 2, 683–702(1927); cf. *C. A.* **21**, 3862.—In addn. to metereological observations in the Karabugaz Sound region, evidence is presented that the deposition of Glauber salt in Karabugaz is of periodic character. The salt is deposited during the 4 winter months (Nov. 20, 1922 to Feb. 15, 1923), while the temp. of the water is 5.5–6.0° and is dissolved during the remainder of the year. G. B. Kistiakowsky.

New theories of the formation of coal. W. Fuchs. *Brennstoff-Chem.* **9**, 153–6 (1928).—A review of recent work of Bergius (*C. A.* **22**, 1027) and that of McKenzie Taylor (*C. A.* **21**, 4049). According to Bergius all plant compds. contributed to the formation of coal since he was able to synthesize coal-like substances from all these substances by heating to 340° with H_2O under pressure. F. does not agree that Bergius' synthetic coals have been shown similar to natural coals. Taylor's work indicates that for a number of cases coalification could have resulted from anaerobic decay of plant materials, a cover impervious to gases being assumed formed by base exchange—Na of NaCl with Al of the clay cover. This may explain the first coalification stages in some cases, but not all coal overburdens are of such a nature as to favor the base exchange phenomenon. J. D. Davis

Investigation of the microbiology of coals as they occur in the coal beds. R. Lieske and E. Hofmann. *Brennstoff-Chem.* **9**, 174–8(1928). J. D. Davis

The chemical composition of peat. I. Chemical nature of organic complexes in peat and methods of analysis. Selman A. Waksman and Kenneth R. Stevens. N. J. Agr. Expt. Sta. *Soil Science* **26**, 113–37(1928).—A method of proximate analysis which accounts for about 90% of the peat is suggested. By the method given different kinds of peat can be differentiated. Low-moor and high-moor peats on the dry basis contained ether-sol. matter 0.43, 4.34; H_2O-sol. 1.71, 1.61; C_2H_5OH-sol. 1.94, 3.40; hemicellulose 11.03, 15.76; pentosan 2.52, 3.60; celluloses 0, 12.35; lignin 44.81, 44.19; crude protein 20.97, 4.94 and ash 13.02 and 1.82%, resp. Similar analyses of peat-forming materials are tabulated. These include results for *Carex, Cladium, Hypnum, Sphagnum, Pinus Strobus* needles and oak leaves. In low-moor peat true cellulose has completely decomposed. The protein content is higher than in the original plant materials because of the synthesizing activity of microörganisms. In high-moor peat much cellulose remains. Waxes have accumulated in high-moor but not in low-moor peat. Thirty-seven references are appended. A. L. Mehring

Notes on the theory of petroleum formation. Conclusions to be drawn from the composition of Cheremchovskii boghead coal. G. Stadnikov and E. Ivanovskii. *Brennstoff-Chem.* **9**, 245–8(1928). The theory most generally held is that the material from which petroleum was formed consisted mainly of oil algae. Boghead coals were most probably formed from the same sort of material; accordingly their primary tars ought to possess petroleum characteristics. The authors subjected such a tar to thorough examn., sepg. the main classes of compds. present. Compds. were mainly unsatd. and satd. hydrocarbons, the latter being paraffins. No cyclic compds. were found and only 1.88% bases and 1.67% tar acids. Low tar acids indicate little humic matter in the coal. One can conclude, therefore, that the cellulose and albumin of the algae from which the coal originated have entirely disappeared and that the coal consists

of polymerization products of the fats and waxes. The compds. in the tar are very similar to those found in petroleum. The result is in agreement with the Fischer-Schrader lignin theory of coal formation in that this involves complete elimination of cellulose and formation of coal humus from lignin. J. D. DAVIS

Notes on the theory of petroleum formation. Conclusions drawn from the composition of tar from Cheremchovskii boghead coal. G. STADNIKOV AND E. IVANOVSKII. *Brennstoff-Chem.* **9,** 261–4(1928); cf. preceding abstr.—The similarity of thermal decompn. products of fats to boghead coal tars has been noted. The authors decompose linoleic acid at 400° in H_2 using Fe supported on asbestos as a catalyst and examg. the products. The reaction proceeds in 2 directions: (1) formation of CO_2 and satd. hydrocarbons and (2) formation of CO, H_2O and unsatd. hydrocarbons. Oxidation of the unsatd. hydrocarbons of both the tar and products from linoleic acid with $KMnO_4$ yielded fatty acids and only a small amt. of succinic acid; glutaric and adipic acids were not formed. The hydrocarbons therefore belonged to the aliphatic and not the aromatic series. Paraffins and unsatd. hydrocarbons were purified by distn. with steam, fractionated and analyzed. In every respect compds. of the tar showed similarity to those obtained from the linoleic acid and to those obtained by Engler (*Ber.* **30,** 2367(1897)) by decompn. of fatty acids. In the first decompn stage of boghead coal fatty acids are probably formed and subsequently decompd. The coal itself is to be looked upon as a mixt. of polymerized fatty acids. J. D. DAVIS

Cholesterol as the mother substance of petroleum. II. N. D. ZELINSKII AND K. P. LAVROVSKII. Univ of Moscow. *Ber.* **61B,** 1291–3(1928); cf. *C. A.* **22,** 89.—From 655 g. cholesterol (I) treated with $AlCl_3$ were obtained 405 g. of a petroleum-like product, d_4^{20} 0.8539, of which about 190 g. distd. over with steam (in the distn. the liberation of dissolved gaseous hydrocarbons was observed). The light oil, treated with concd. H_2SO_4, washed well and dried, yielded 2 fractions: 120 g., b. 35–150° and 63 g., b. 150–250°. These were further fractionated and the individual fractions subjected to dehydrogenation catalysis to det. the chem. nature of their constituents. The results of this and the earlier work show that the artificial petroleum prepd. from I is a complex mixt. of hydrocarbons contg. only very small quantities of aromatic derivs. and consisting chiefly of paraffins and cycloparaffins; among the latter, the derivs. of cyclohexane predominate. They are easily dehydrogenated and after removal of the resulting aromatic hydrocarbons the residues consist either exclusively of compds. C_nH_{2n+2} or of mixts. of these with cycloparaffins (naphthenes) with no hexahydroaromatic character. **Addendum.** N. D. ZELINSKII. *Ibid* 1293–4.—Brief reply to Steinkopf (*C. A.* **22,** 1163). C. A R.

Indications of petroleum in Sundgau (Upper Alsace). JEAN JUNG. École nat. superieure petrole comb. liquides. *Ann. office nat. comb. liquides* **3,** 165–89(1928)—A study of the geology of the region (described in detail) and signs of petroleum at Sentheim and Hirtzbach indicate that the existence of petroleum is possible in Sundgau, which is a part of the basin west of Mulhouse between the Vosges and Jura mountains. R. E. SCHAAD

Mirabilite as a product of the activity of Vesuvius. F. ZAMBONINI. *Ann. R. Osservatorio Vesuviano* [3], **2,** 117–9(1925); *Mineralog. Abstracts* **3,** 550.—Small stalactites of a saline incrustation consist mainly of mirabilite with some aphthitalite. The existence of *exanthalite* is doubtful and $Na_2SO_4.2H_2O$ could not be obtained artificially. *Lecontite* is probably a mixt. of the double salts $NaKSO_4.2H_2O$ and $NaNH_4SO_4.2H_2O$ rather than $(Na,K,NH_4)_2SO_4.2H_2O$. The mirabilite has no doubt been produced by the secondary hydration of thenardite and "exanthalite" is probably a mixt. of the two. J. F. SCHAIRER

The presence of soluble compounds of selenium and tellurium as products of the activity of Vesuvius. F. ZAMBONINI AND L. CONIGLIO. *Ann. R. Osservatorio Vesuviano* [3], **2,** 3–6(1925); *Mineralog. Abstracts* **3,** 550.—A short review of the literature on occurrences of Se and Te in volcanic products. A yellow crust (1925) consisted of opal, S, chlorides and sulfates of alkali metals with Fe, Pb, Cu and Ca. The aqueous soln. contained Se 1.25% of the incrustation and Te 0.04%. J. F. SCHAIRER

New observations on the lavas of the islands of Marquesas and Tubuai, Southern Polynesia. A. LACROIX. *Compt. rend.* **187,** 365–9(1928).—Chem. analyses by Raoult of 21 samples of these lavas are reported. These include 6 trachytes, 9 basalts, 2 phonolites, 2 andesinic andesites, a latite and an ankramite. **New observations on the lavas of the leeward islands of the Society Archipelago.** *Ibid* 397–401.—These lavas are discussed on the basis of chem. analyses of 14 samples by Raoult, comprising 6 basalts, 3 gabbros, 2 pegmatoids and 1 each of latite, doreite and labradoric andesite. L. W. RIGGS

The pegmatoids of volcanic rocks with basaltic facies. A. LACROIX. *Compt. rend.* **187,** 321–6(1928).—Nine analyses by Raoult are reported for samples of andesinic basalt and pegmatoids from Beaulieu, France, Bora-Bora Tahitian Archipelago and Weit'chang, Hoa-mou-keow, North China. These analyses are discussed from the lithologic and genetic points of view. L. W. RIGGS

Note on the alkali lavas of Mount Nimrud, Armenia. G. T. PRIOR. *Mineralog. Mag.* **21,** 485–8(1928).—The alkali rocks of Mount Nimrud show strong similarities to those of the Rift Valley region in East Africa. They vary from riebeckite-rhyolite containing free quartz to more basic types with olivine. Anorthoclase is the prevailing feldspar. Other minerals present include aegirine, riebeckite and cossyrite. Chem. analyses are given of comendite, kenyte and trachyandesite. W. F. HUNT

Mannum granite. B. F. GOODE. *Trans. Proc. Roy. Soc. S. Australia* **51,** 126–8 (1927).—This granite from Section 156, Hundred of Younghusband, has the compn: SiO_2 70.77, Al_2O_3 13.69, Fe_2O_3 1.97, FeO 0.97, MgO 0.34, CaO 0.94, Na_2O 3.70, K_2O 5.68, TiO_2 0.72, MnO 0.28, P_2O_5 0.11, FeS_2 0.17, H_2O—0.45, H_2O + 0.36, sum 100.15%; sp. gr. 2.66. Microscopic measurements by the Rosiwal method gave the mineral compn.: quartz 25.99, orthoclase 34.09, plagioclase 30.75, biotite 3.13, Fe ores 3.33, sphene 1.86, apatite 0.62, sum 99.77%. L. W. RIGGS

Bismuth mines in Bolivia. FRIEDRICH AHLFELD. *Metall Erz* **24,** 353–6; *Chem. Zentr.* **1927,** II, 1559.—The primary Bi ores are Bi glance and pure Bi. Bi ocher is the most important of the secondary ores. The deposits are worked unsystematically, since the world requirements of Bi are so small. Ore contg. less than 2% Bi is of no value for working. The ore is not dressed, but only sepd. by hand. C. C. DAVIS

[From the gold mines of Jilové.] JINDŘICH L. BARVIR. Privately printed, Prague, **1927,** 120 pp.; *Mineralog. Abstracts* **3,** 491.—The petrogenetic and metallogenetic features of the ancient Au mining district of Jilové are described. Of special interest (p. 50) is the report on expts. on the pptn. of Au by interaction of solns. of $AuCl_3$ on pyrite associated with chlorite. More Au was deposited on the chlorite than on the pyrite. J. F. SCHAIRER

The copper deposits of Belgian Congo. ENRIQUE FALCAT. *Quim. ind.* **5,** 140–3 (1928). MARY JACOBSEN

Microscopic-mineralogical studies of the copper sulfide ores of the Sieglünd spathic iron deposits. RÜDIGER RÜCKERT. *Neues Jahrb. Min. Abt. A, Beil.-Bd.* **53,** 185–96 (1926).—Polished sections of Cu ores were studied. An analysis of *sychnodymite* is included. By means of the microscopic studies the chem. alteration of the ores by hydrothermal solns. is followed. J. F. SCHAIRER

Micrographs of the iron ore minerals of basalt. H. W. LINDLEY. *Neues Jahrb. Min. Abt. A, Beil.-Bd.* **53,** 323–60(1926).—A detailed description of the Fe ores occurring in basalt of Vogelsberg. From published analyses the course of chem. differentiation is traced. J. F. SCHAIRER

The iron ore deposits of the Oberharz diabase ranges and their relation to the Brocken-contact. PAUL RAMDOHR. *Neues Jahrb. Min. Abt. A, Beil.-Bd.* **55,** 333–92 (1926–7).—Analyses of fayalite, cordierite, fayalite-spinel-cordierite hornfels and mica peridotite are given. J. F. SCHAIRER

The iron deposits of the Union of South Africa. PERCY A. WAGNER. *Mem. Geol. Surv. S. Africa* No. **26,** 264(1928); *Mineralog. Abstracts* **3,** 490.—This memoir includes the history, classification, discussion of origin and description of the iron ores and ore reserves of S. Africa. J. F. SCHAIRER

Formation relations of the iron ore deposits from the system ferric chloride–water. ERNST STIRNEMANN. *Neues Jahrb Min. Abt. A, Beil.-Bd.* **53,** 59–94(1926).—A brief summary is given of the literature on the occurrence of $FeCl_3$ as one of the volatile components of magmas. The equil. data on the system $FeCl_3$–water (cf. *C. A.* **21,** 3572) are applied to the Fe ore deposits. A description is given of the methods used in making artificial hematite and magnetite. The phys.-chem. data are applied to the Fe ore deposits of Braunfels, Elba, Oslo and Clifton-Morenci. J. F. SCHAIRER

The iron and manganese ore deposits near Oberrosbach, Oberhessen province. W. WITTE. *Neues Jahrb. Min. Abt. A, Beil.-Bd.* **53,** 271–322(1926).—Analyses of ore and rocks inclosing the ore are included. J. F. SCHAIRER

The occurrence of manganese in the state of Minas Geraes, Brazil. M. SCHWERBER. *Metall Erz* **24,** 329–31; *Chem. Zentr.* **1927,** II, 1461–2.—Manganese ores occur in the form of pyrolusite in veins and boulder deposits. The latter are at present of no significance. The Mn content of the former is quite const. at 48–50%. The veins

which are imbedded in Fe-contg. argillite are mined mostly in open works, some also in deeper mines. J. S. REICHERT

Manganese ore deposits in Tschiaturi (Caucasus). W. DE LA SAUCE. *Abh. prakt. geol. Bergwirtschaftslehre* **8**, 90(1926); *Neues Jahrb. Mineral., Geol., Paläont., Abt. B* **1927**, II, 207–8; *Chem. Zentr.* **1927**, II, 2541.—In 1913 the deposits yielded over 0.5 of the world requirements, and are adequate for the same needs for another 60 yrs. The ore is predominantly MnO_2 and is easily obtained. Its origin is attributed to weathering and soln. of the granite massiv of Suram. C. C. DAVIS

Nickel. N. A. SHADLUN. *Commission for the study of the natural products of Russia, Russ. Acad. Sci.* **4**, No. 5, 7(1923); *Mineralog. Abstracts* **3**, 492.—Special reference is made to the Novo-Cheremshansky mine. The clayey Ni ores occur in polianite, siderite, limonite and lignite. The last contains C 42% and ash 6–7%. The ash contains 3–15% Ni and 40% $CaSO_4$. This type of ore is named *kerzinite*. The Ni-bearing polianite ore (Ni 4–7%) has been derived from serpentine, which as dunite was intruded as veins in marble. The richer ore (Ni 12–15%) lies in contact with the marble. J. F. SCHAIRER

The optical properties, density and changes of state of zircon. WILHELM F. EPPLER. *Neues Jahrb. Min. Abt. A, Beil.-Bd.* **55**, 401–87(1926–7).—See *C. A.* **22**, 3823. J. F. SCHAIRER

Iodine in nature. XII. Geochemistry of iodine (3). The atmophile character of iodine. TH. VON FELLENBERG. *Mitt. Lebensm. Hyg.* **19**, 43–8(1928); *Biochem. Z.* **193**, 384–9(1928); cf. *C. A.* **17**, 2717; **21**, 3034, 3586.—Gases from mofette, springs and rocky walls contained I. Gases from the mofette tested were 40 times richer in I than gas from springs. The geological origin of the I impregnation of volcanic gases is discussed. L. W. RIGGS

Iodine in phosphate deposits. ERNST WILKE-DÖRFURT, JULIUS BECK AND GASTON PLEPP. Stuttgart tech. Hochschule *Z. anorg. allgem. Chem.* **172**, 344–52(1928).—Apatite is known to contain F and Cl and I may be expected to be present. Artificial iodo-apatites were made by fusing tricalcum phosphate and KI at 1420° and the product gave 0.09%; in another case it gave 0.25%. As an iodopatite should contain about 20% I, these were not useful indications of its existence. Norwegian and Canadian (Renfrew Cities) apatite was analyzed and a very small I content was found. Fellenberg also records very low values for I in apatite. Conclusion: I cannot be combined with apatite in phosphate deposits. Differences in I content are explained by climatic conservation or aq. extn. and where the I content is high this is assumed to be org. in origin. The method used for the detn. of the I is given. A table of I content is given for 25 apatites from different sources; the highest appears from Limberg (280 mg./kg.). S. L. B. ETHERTON

Meteoric falls in France and her colonies preserved in the national natural history museum, with remarks on the classification of meteorites. ALBERT LACROIX. *Bull. Mus. Nat. Paris* **33**, 411–55(1927); *Mineralog. Abstracts* **3**, 534.—Regarding meteorites as igneous rocks, the following classification is proposed. I. Sporadosiderites (arolites). 1. Magnesio-calcic group (*a*) feldspathic; (*b*) non-feldspathic. 2. Magnesian group (*a*) peridotitic; (*b*) pyroxeno-peridotic; (*c*) pyroxenic. II. Syssiderites (lithosiderites). 1. Magnesian group (*a*) peridotitic; (*b*) pyroxeno-peridotic; (*c*) pyroxenic. 2. Magnesio-calcic group. III. Holosiderites. (*a*) Mionickeliferous; (*b*) Plionickeliferous; (*c*) Nickelic. J. F. SCHAIRER

Morphological and structural relations of meteoric irons in connection with their origin. J. LEONHARDT. *Fortschritte Mineral. Kryst. Petrog.* **12**, 52–5(1927).—*Kamacite* from various meteoric irons was examined by the powder and rotating-crystal x-ray methods. It shows a body-centered lattice with the edge a = 2.84 A. U. Laue photographs show that they fall into two groups: (1) with diffused spots representing paramorphs after α-iron; (2) showing normal spots representing single homogeneous crystals due to recrystallization and slower cooling. Formulas are given for calculating the orientation of sections from the angles of the Widmanstätten figures and for the orientation of Laue photographs. J. F. SCHAIRER

The structure of iron meteorites following the δ–γ-inversion of iron. RUDOLF VOGEL. *Neues Jahrb. Min. Abt. A, Beil.-Bd.* **53**, 134–48(1926); cf. *C. A.* **19**, 2009. J. F. SCHAIRER

The meteoric iron from Savik near Cape York, North-Greenland. O. B. BÖGGILD. *Meddel. om Grönland* **74**, 11–30(1927); *Mineralog. Abstracts* **3**, 535.—An analysis of a portion of the Cape York meteoric iron gave Ni 7.25, S 0.022, P 0.166, Cr trace, Si, C, Co, Cu nil., sp. gr. 7.91. Nodules and some streaks of troilite (0.65%) and small amts. of chromite and rhabdite are present. J. F. SCHAIRER

Mineral statistics. ANON. *Mineral Ind.* **36,** 688–748(1927).—Tables of production and trade for the principal countries of the world. A. B.

Outline of the history and present status of chemistry in the Institute of Mines. N. STEPANOV. *Ann. inst. anal. phys-chim.* (*Leningrad*) **3,** 510–24; *Chem. Zentr.* **1927,** II, 2641.—Deals with the Institute of Mines at Leningrad, founded in 1774. C. C. DAVIS

Annual report on the mineral resources of U. S. S. R. during the fiscal year 1925–6. *Leningrad* (*Geol. Committee*) Vol. **1,** 804(1927); *Mineralog. Abstracts* **3,** 492.—This volume with title-page, editorial note, contents, summary and index given in Russian and English is analogous to American publications such as "Mineral Resources of the U. S." All the metallic and non-metallic minerals of economic importance are reported. J. F. SCHAIRER

The geology and mineral industry of Western Australia. A. G. MAITLAND AND A. MONTGOMERY. *Bull. Geol. Survey W. Australia* No. **89,** 119(1924).—The principal mineral products of greatest importance in W. Australia are Au, Ag, coal, Sn, Cu, Pb and phosphates. Magnesite, salt, alunite, gypsum and mineral fertilizers are also produced. Data on production and occurrence of ores are given. Two analyses of glauconitic sandstone and marl mined at Gingin for the extraction of potash salts are given. A map showing the chief localities at which useful minerals are found is included. J. F. SCHAIRER

The mineralogy and petrography of the Rhön. F. HEIDE. Univ. Göttingen. *Chem. Erde* **3,** 91–7; *Chem. Zentr.* **1927,** II, 2659.—The montmorillonite of Rupsroth (Rhön) occurs in a very pure state in veins. The intense raspberry-red to white material which has a matted structure has a mean *n* value of 1.545 ± 0.006. X-ray examn. showed the same interferences as those of nakrite, with a diffuse blackening of probably amorphous substances which may consist of a mixt. of kaolin silicate with a gel. Analyses also indicate this compn. The investigation points to montmorillonite as possibly a very fine dispersion of Al_2O_3-SiO_2 gel particles in a kaolin network. Its occurrence in the Rhön region is attributed to deposition from aq. residues of phonolite magma. C. C. DAVIS

Geological and petrographic studies of the Kainuu region. HEIKKI VÄYRYNEN. *Bull. comm. géol. Finlande* No. **78,** 127(1928).—Analyses of leptite, sericite schist, gabbro-metabasite, amphibole from a metabasite, greenstone, amphibole from a greenstone, quartz keratophyre, phyllite-mica schist, carbonaceous phyllite and black schists are given. J. F. SCHAIRER

Petrography and geology of the Kaiserstuhl mountains in Breisgau. J. SOELLNER. *Neues Jahrb. Min. Abt. A, Beil.-Bd.* **55,** 299–318(1926–7).—Analyses of essexite gabbro, theralite gabbro, monzonite, theralitic ijolite, dolerite and anamesite are given. J. F. SCHAIRER

Petrographic notes on tonalite from the Palmer District and biotite-norite from South Black Hill. A. R. ALDERMAN. *Trans. Proc. Roy. Soc. S. Australia* **51,** 20–3 (1927).—Tonalite from Section 380, Hundred of Finnis, Sturt Co., gave on analysis: SiO_2 63.88, Al_2O_3 16.37, Fe_2O_3 1.99, FeO 2.96, MgO 2.24, CaO 5.18, Na_2O 3.66, K_2O 1.61, TiO_2 0.86, P_2O_5 0.23, MnO 0.07, H_2O (combined) 0.45, H_2O (hygroscopic) 0.21, sum 99.71%; sp. gr. 2.792. Biotite-norite from Section 240, Hundred of Ridley, at South Black Hill gave: SiO_2 53.37, Al_2O_3 14.25, Fe_2O_3 2.55, FeO 7.44, MgO 5.04, CaO 8.87, Na_2O 2.50, K_2O 2.96, TiO_2 1.70, MnO 0.15, P_2O_5 1.24, H_2O (combined) 0.19, H_2O (hygroscopic) 0.22, sum 100.48%; sp. gr. 3.128. The results of the microscopical examn. of the rocks are reported. L. W. RIGGS

Plaffeiite, the fossil resin of the Flysch of Plaffeien. A. TSCHIRCH AND KATO. *Mitt Naturfor. Gesell. Bern* **1925,** 13–19; *Mineralog Abstracts* **3,** 475.—An amber-yellow resin occurs as fragments in nests and bands in the Flysch at Plaffeien, Switzerland. It is brittle, m. 211° and differs from all other fossil resins in chem. characters. Thirteen different resins (m. 60–284°) were extd. by solvents. Analyses of some of these resins are given. J. F. SCHAIRER

Unknown hydrosilicate-gel from the Rac quarry near Székes-Fejérvár. JÁNOS ERDÉLYI. *Magyar Chemiai Folyoirat* **33,** 133–5(1927); *Mineralog. Abstracts* **3,** 505.—A granite is coated with a soft pinguite-like decompn. product with a grass-green color. It was sol. in concd. HCl. An analysis is given. J. F. SCHAIRER

The auriferous lodes of the Gibraltar district, Coolgardie goldfield. F. R. FELDTMANN. *Bull. Geol. Survey W. Australia* No. **91,** 29(1925).—The lodes characteristic of the Gibraltar district consist of bands of schist with numerous quartz stringers and lenses of quartz. In the oxidized zone chloropal and halloysite occur and are accompanied by the richer ore. The ore bodies are low grade and the Au is erratic.

The Au came from the same magma as the pegmatities of the region but was deposited subsequent to their intrusion. J. F. SCHAIRER

The rock-making alkali hornblendes. W. KUNITZ. *Fortschritte Mineral. Kryst. Petrog.* **12,** 49–50(1927); cf. *C. A.* **22,** 2342.—A brief discussion of isomorphism in the alkali hornblende series. J. F. SCHAIRER

Crystallophyllitic rocks of Mayombe, French equatorial Africa. V. BABET. *Compt. rend.* **187,** 348–50(1928).—These rocks along the line of the "Congo-Ocean" railroad are classified as feldspathic with gneissic aspect, and nonfeldspathic. Analyses by Raoult are reported for albitic gneiss with sericite, albitic gneiss with 2 micas, chlorite-epidote-bearing mica schist, calciferous mica schist with epidote, epidotite and micaceous calciferous epidotite. L. W. RIGGS

The geological formation of clay. J. FISCHER. *Tonind.-Ztg.* **52,** 1231–3, 1272–3 (1928).—F. accepts the view that clay was formed by the action of CO_2-water on silicates which decomposed the rocks and dissolved the alkalies and alkali silicates. H. G. SCHURECHT

Augites from the rocks of the Euganean Hills. M. STARK. *Neues Jahrb. Min. Abt. A, Beil.-Bd.* **55,** 1–35(1926–7).—Optical data are given for various augites. J. F. SCHAIRER

Granodioritic mixed rocks of the Friedeberg intrusive mass. F. K. DRESCHEN. *Neues Jahrb. Min. Abt. A, Beil.-Bd.* **54,** 243–91(1926).—Analyses of aplite, granite gneiss, quartz-biotite gneiss, plagioclase-biotite gneiss, dioritic inclusions and granodiorite are included. Diagrams are given showing the relation of the chem. compn. of the different rocks. J. F. SCHAIRER

Rocks from Peter I Island, West Antarctic. OLAF A. BROCH. *Avhandl. Norske Vidensk.-Acad. Oslo, Mat.-Naturv. Kl.,* No. 9, 41(1927); *Mineralog. Abstracts* **3,** 500.—A detailed petrographic description is given of pebbles dredged from a depth of 6–7 fathoms close to the shore of Peter I Island. Four analyses of these rocks are included. J. F. SCHAIRER

Rocks of the Viborg-Rapakivi granite. WALTER WAHL. *Fennia (Bull. Soc. Geogr. Finland)* **45,** No. 20, 127(1925); *Mineralog. Abstracts* **3,** 499.—Petrographic. The mica of the Rapakivi-granite is a ferroferri-mica called *monrepite,* $KH_2Fe''Fe'''(SiO_4)_3$ J. F SCHAIRER

A custerite-bearing contact rock from California. C. E. TILLEY. *Geol. Mag.* **65,** 371–2(1928).—A rock from Crestmore, Calif., was found to contain vesuvianite, custerite, monticellite and calcite. New data on the optical properties of *custerite* $[Ca(F,OH)]_2SiO_3$, show that the mineral is monoclinic, optically +, Z being approx. normal to the twinning lamellas and the obtuse bisectrix emerges from sections cut normal to the lamellas. $\alpha = 1.588$, $\gamma = 1.600$. The occurrence of these rare minerals is a consequence of incomplete equil. during metamorphism. J. F. SCHAIRER

Fresh-water lime-manganese rocks and lime-magnesia fresh-waters. H. KLÄHN. *Chem. Erde* **3,** 453–587(1928); cf. *C. A.* **21,** 3864.—A detailed account of travertine deposits (fresh-water limestones and dolomites), with a discussion of the conditions for their formation and the compn. of the waters from which they are deposited. B. C. A.

Chemistry of the eruptive rocks of Gleichenberg, Steiermark. A. MARCHET. *Fortschritte Mineral. Kryst. Petrog.* **12,** 56–7(1927).—A brief summary of the chemical changes and rock types of the region. J. F. SCHAIRER

Chemical and petrographical investigations of the Kiev marl or spondylustone. Its homologs among recent marine formations. V. CHIRVINSKII. *Bull. sect. Ukraine Comité Geol.* **1926,** No. 8, 1–39; *Chem. Zentr.* **1927,** II, 1938.—The marl is very widely distributed, is of the lower Tertiary, and contains 48.76–100% clay, 0.–56.22% $CaCO_3$ and quartz, glauconite, pyrite, gypsum and other minerals. The marl is similar to blue ocean mud. C. C. DAVIS

"Cone-in-cone" marl. G. LINCK AND W. NOLL. *Chem. Erde* **3,** 699–721(1928).—A discussion of "cone-in-cone" structure in marls, including "nail limestone," with descriptions of material from Thuringia and Romania. Analyses show that $CaCO_3$ is the main constituent, with considerable and variable amts. of clayey matter and free SiO_2. The structure is attributed to the crystn. of a $CaCO_3$ gel in the presence of much foreign matter. Comparisons are made with a similar structure in fibrous celestite pseudomorphous after gypsum from Jena. B. C. A.

A biotite-scapolite schist from Petrov near Kunstat. J. ŠTĚPANEK. *Časopis Moravskeho Zemskeho Musea, Brno* **25,** 202–13(1927); *Mineralog. Abstracts* **3,** 548.—The scapolite occurs as porphyroblasts in a biotite schist. Approximate compn. 70% carbonate meionite with 30% chloride and oxide-marialite. J. F. SCHAIRER

Pipes in the coast sandstone of Syria. ALFRED ELY DAY. *Geol. Mag.* **65**, 412–5 (1928).—Analyses of sandstone, beach sand, dune sands and red sands are given. J. F. SCHAIRER

Comparative study of the weathering of rocks under different climatic conditions. E. BLANCK AND A. RIESER. *Chem. Erde* **3**, 437–52(1928).—Fragments of sandstone and of limestone were exposed to the weather during a period of 5 years at Göttingen and on the summit of the Brocken (1142 m.), where, owing to the difference in altitude, there are marked differences in the temp., rainfall and humidity. Detailed analyses of the rocks and of the portions extd. by HCl, both before and after the expt., showed no appreciable differences in compn. B. C. A.

Soils (and rock weathering) in Spitzbergen. E. BLANCK, A. RIESER AND H. MORTENSEN. *Chem. Erde* **3**, 588–698(1928).—A study of rock weathering under arctic conditions. Numerous detailed analyses are given of various rocks (sandstone, quartzite, clay-slate, phyllite, diabase and calcareous shale) and of their disintegration products, including soils and muds; analyses are also given of the portions extd. by HCl and by H_2SO_4 from the débris. Chem. action in weathering is here retarded owing to deficient water circulation, and the action of frost is of more importance in breaking down the rocks. B. C. A.

Chert deposits in Ecuador, South America. GEORGE SHEPPARD. *Geol. Mag.* **65**, 343–53(1928).—Analyses of shale and chert are included. Two classes of cherts are found in the region: primary chert, deposited from solution as a direct result of proximity to igneous intrusions and a secondary chert, derived from Tertiary shales which have become completely silicified. J. F. SCHAIRER

The miocene soils between the Senio and Sillaro valleys. P. PRINCIPI. *Atti accad. Lincei* [6], **7**, 579–86(1928).—The geology and mineralogy are described in detail. C. C. DAVIS

Red soils of Cochin China. V. AGAFONOV. *Compt. rend.* **187**, 428–31(1928).—The samples studied were from Anloc and Susannah. Analyses of the original basalt and of the red soils formed by the decompn. of basalt show a progressive and almost complete disappearance of Mg, a pronounced loss of Ca and alkalies and a large oxidation of FeO to Fe_2O_3. The water of constitution (H_2O+) was greatly increased; the Al and Ti contents were nearly doubled. The p_H of the soils ranged from 4.57 to 5.58. The quantities of CaO and MgO absorbed were insufficient to neutralize the acid products of decompn. These changes are discussed lithologically. L. W. RIGGS

The origin of the red earth in the most northern region of its occurrence. E. BLANCK, F. GIESECKE, A. RIESER AND F. SCHEFFER. *Chem. Erde* **3**, 44–90; *Chem. Zentr.* **1927**, II, 2778.—With ground profiles on hand, the authors try to explain the origin of the north Italian red earths. The red color is only to be found in lime-contg. soils, when the underlying limestone already possesses this color. Even then the color may be masked, if a sufficient amt. of org. substances is present in the ground. These red soils frequently are the final product of weathering, after the carbonates have been carried away. The real red earth frequently results from deposition of Fe from Fe-contg. solns. G. SCHWOCH

The rain of ashes of April 26, 1928, at Cernauti and environs. N. D. COSTEANU AND AL. COCOSINSCHI. *Compt. rend.* **187**, 449–50(1928).—An analysis of the grayish powder which fell at C. during and after a rain. The powder contained oxides and carbonates of Si, Fe, Al, Ca, Mg, Na and K. E. G. VANDEN BOSCHE

Salt formation in the Chilean desert. W. WETZEL. *Chem. Erde* **3**, 375–436 (1928).—Microscopical examn of thin sections of Chile saltpeter (caliche) showed the presence of halite, nitratine, darapskite, gypsum, anhydrite, thenardite, glauberite, bloedite, "Chile-loeweite" [minute trigonal crystals with ϵ 1.434, ω 1.470, d 2.153 and, after deducting impurities, the compn. $K_2Na_4Mg_2(SO_4)_5.5H_2O$], "chromloeweite" (?), and leonite (?). $KClO_4$, although a product of extn., could not be detected as crystals in the raw caliche. The distribution and relative ages of formation of each of these salts are discussed in detail. It is considered that the nitrates were formed by the action of atm. HNO_3 on the alkali silicates of the rocks of the region. B. C. A.

Paralana hot spring. DOUGLAS MAWSON. *Trans. Proc. Roy. Soc. S. Australia* **51**, 391–7(1927).—The description is mainly geological. The water issues at the rate of 1000 gal. per hr. at a temp. of 62°. The total solids were 75.73 grains per gal., hardness (temporary) 9.01, of which 8.22 were due to Ca, no permanent hardness. The water was strongly radioactive, but further tests are necessary to decide on the radioactive elements present. L. W. RIGGS

Rare gases from thermal springs and the great earthquakes of April 14 and 18, 1928, in Bulgaria. N. P. PÉNTCHEFF. *Compt. rend.* **187**, 243–4(1928); cf. *C. A.* **22**,

1307.—Although the earthquakes have affected greatly the H_2O output of the springs, the % of rare gases and their He/A ratio has not been affected. The earthquakes appear to change the radioactivity of the springs. Thus: in Curie $\times 10^{-10}$ per liter H_2O: Tchonlondja in 1911, 17; in 1928, after earthquake, 44; Kovalnik in 1916, 110; in 1928, after earthquake, 93. G. CALINGAERT

Investigations of van't Hoff and his co-workers on the formation of the Stassfurt salt deposits. J. A. KABLUKOV. *Ann. inst. anal. phys. chim.* (Leningrad) 3, No. 2, 760–841(1927).—A detailed review. G. B. KISTIAKOWSKY

Classification of saturated salt lakes. B. P. KROTOV. *Ann. Inst. Anal. phys.-chim.* (Leningrad) 3, 641–61; *Chem. Zentr.* 1927, II, 2659.—Salt lakes which deposit free salts are divided into 5 types: (1) those in which the ratios: $[Cl]/[SO_4](=x)$ and $[MgCl_2]/[MgSO_4](=y)$ are the same as in ocean water and in which $CaCO_3$ is the only deposit; (2) those poor in $CaSO_4$, where x is abnormally low, and in which NaCl is deposited; (3) those poor in $MgSO_4$, $CaSO_4$ and NaCl, where y is abnormally high; (4) those poor in $CaSO_4$ and NaCl and in which $MgSO_4$ is absent, and where x and y are infinitely great, and (5) the $CaCl_2$ type. The conditions controlling the origin of these types are discussed. An explanation is also given of the frequently observed changes in the compn. of salt waters. C. C. DAVIS

The Tambukan lakes. W. M. BUDRIK. *Verlag Balneolog. Inst. Kaukas. Mineralwässer* 1926, I, 190 pp. and II, 68 pp.; *Chem. Zentr.* 1927, II, 1938.—The Tambukan lakes are typical bitter lakes. Their bottom is covered with black mud contg. hydrotroilite ($FeS.H_2O$). This mud is used for balneological purposes. In the gypsum-contg. slate clay of the Batalin stratum, all fissures contain yellow natrojarosite mixed with a small amt. of loewigite. In the cold season, the lakes deposit Glauber's salt. The mud contains 0.210% of free S. G. SCHWOCH

The meaning of radioactivity in the history of the earth. OTTO HAHN. *Naturw. Monatsch.* 24, 65–76; *Physik. Ber.* 8, 720(1927).—A summary of the detns. of the age of the earth crust from He and Pb content of U minerals, heat content, pleochroic haloes, etc. G. L. CLARK

Microbiology of coals in the seam (LIESKE, HOFMANN) 21. So-called rhythmic crystallization (BERNAUEN) 2. Measurements of the thermal conductivity of crystals and crystalline material (EUCKEN) 2. Petrographic studies of coal on the basis of the specific gravities of the components which are separated by centrifuging in heavy liquids (GROSS) 21. The absorption of the visible and ultra-violet light and the interference of x-rays in tourmaline (STAMM) 2. Radioactive haloes in fluorite from Wölsendorf (SCHILLING) 3. Recent work on the petrology of brown coal (BODE) 21. The lattice constant of Ba telluride (HAASE) 2. Coagulations (WIEGNER) 2. The coal fields of Scotland (LANDER) 21. Examination of decayed oak. The Fischer-Schrader coalification theory (BRANDL) 21. Clays and clay development of Louisiana (WHITTEMORE) 19. Tertiary clays of California (LINTON) 19. "Tepetate" soil in Mexico (HELLMERS) 15. Natural gas (STOCKFISCH) 21. The dehydration of kaolin (PIETERS) 19. The classification of coal (PARR) 21. The Ra and Th contents of volcanic rocks from Hegau (LEDERER) 3. The Ra and Th contents of the phonolite of Kaiserstuhl (SEITH) 3. Radioactive waters in Poland (GRABIANKA) 3.

9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST, R. H. ABORN

The best yields (from ores). JOSEF FINKEY. *Metall u. Erz* 24, 29; *Chem. Zentr.* 1927, II, 1073–4.—An explanation of the principle that in ore dressing the best sepn. is obtained when the bed of the concentrate lowest in mineral content or the richest bed of the waste has the same mineral content as the raw ore. J. S. R.

Progress in ore dressing and coal preparation in 1927. ROBERT H. RICHARDS AND CHARLES E. LOCKE. *Mineral Ind.* 36, 634–87(1927).—A review, including crushing and grinding, screening, classifying, settling, filtering, hand sorting, jigs and tables, amalgamation, magnetic sepn., flotation, app., principles and theory, examples of practice, and an extensive bibliography. A. B.

New laboratory flotation cell developed at University of Utah. H. D. KEISER. *Eng. Mining J.* 126, 504–5(1928).—Small cells are built of celluloid, with rivets and impeller shaft coated with collodion. They are easily made and cleaned and have the advantage of transparency, besides avoiding the corrosion which had given trouble in the former cells made of metal. A. BUTTS

Development of flotation at Broken Hill. E. J. HORWOOD. *Eng. Mining J.* **126**, 457–9(1928).—With the lowering of the grade of Broken Hill ore came the necessity of developing means of recovery other than blast furnace smelting formerly in use. H. C. PARISH

Metallurgical treatment of flotation concentrates. DWIGHT. Dwight and Lloyd Sintering Co., N. Y. *Bull. Am. Zinc Inst.* **11**, No. 5–6, 90–106(1928).—The difficulties of handling flotation concentrates as received by the smelter and the advantages of putting them in a coarser condition are given. The universal method adopted has been the Dwight and Lloyd process of sintering. "As ordinarily practiced it consists in arranging the ore on a grate in a thin layer, uniformly pervious to air currents, igniting the combustible elements on the upper surface of the mass and passing air currents through the layer in a downward direction. The ignition thus started on the upper surface is slowly propagated downward in a thin zone of intense oxidation producing at a given point a momentary melting effect, at which moment the semifused material is whipped by the air currents into thin films and cells and the next instant is chilled into a porous, coke-like mass we call 'sinter.'" The application of the process to Pb, Cu and Zn concentrates is discussed. J. W. BOECK

Aluminum and bauxite. ANON. *Mineral Ind.* **36**, 11–27(1927).—A discussion of production, alloys, trade, etc., with statistics. A. B.

Antimony. K. C. LI. *Mineral Ind.* **36**, 28–33(1927).—A review of the Sb market and production. A. B.

Bismuth. C. P. LINVILLE. *Mineral Ind.* **36**, 61–3(1927).—Production and trade in Bi are discussed. A. B.

Cadmium. C. P. LINVILLE. *Mineral Ind.* **36**, 71–3(1927).—A review of production and uses. A. B.

Chromium. WILLIAM D. JOHNSTON, JR. *Mineral Ind.* **36**, 74–80(1927).—Marketing, metallurgy, and output are discussed, with statistics and a bibliography. A. B.

Cobalt. C. W. DRURY. *Mineral Ind.* **36**, 112–6(1927).—Production, trade, metallurgy, and uses are reviewed. A. B.

The manufacture of cobalt oxide and its purification from ores in the wet way. A. WEISSENBORN. *Metallbörse* 17, 1716–7, 1826–7; *Chem. Zentr.* **1927**, II, 1996.—Various methods are described for the decompn. of Co ores and the sepn. of the metal in the solns., especially the sepn. of Mn and Ni from Co. To det. the completeness of the decompn., a *colorimetric method* was developed, which depends upon the property of Co compds. to color thiocyanates blue. C. C. DAVIS

The metallurgy of copper in 1927. LEONARD S. AUSTIN. *Mineral Ind.* **36**, 165–205 (1927).—A review of literature, plant construction and new developments. A. B.

Copper. A. B. PARSONS. *Mineral Ind.* **36**, 117–58(1927).—A discussion of world production, trade, prices, etc., with statistics. A. B.

Utilization of copper and copper alloys. WM. G. SCHNEIDER. *Mineral Ind.* 36, 159–65(1927).—A discussion of prices, uses and general conditions in the industry. A. B.

Copper smelting at Douglas. XVI. E. H. ROBIE. *Eng. Mining J.* **126**, 293–6 (1928).—Current practice and equipment at 2 smelters, the Copper Queen and the Calumet & Arisona, are described. A. BUTTS

Utah Copper's new precipitating plant. H. D. KEISER. *Eng. Mining J.* **126**, 534–7(1928).—Natural surface waters are caused to percolate through dumps of waste rock and overburden carrying 0.3 to 1.0% Cu. The av. flow treated is 1,000,000 gal. in 24 hr., contg. 20 lb. of Cu per 1000 gal. It is conveyed to the plant through a Cu-banded wood-stave pipeline, and is treated in 72 20-ft. pptg. boxes contg. detinned iron scrap. A. BUTTS

Limits of fuel consumption and economy in pyritic copper smelting. E. HENTZE AND FRAULOB. *Metall u. Erz* **24**, 278–85; *Chem. Zentr.* **1927**, II, 1075.—A number of conditions are described which govern the economy of smelting pyritic Cu, namely, the phys. and chem. properties of the ores, their behavior on storage, the operation of the shaft furnace, etc. J. S. REICHERT

The ammoniacal lixiviation of copper ores. A. S. SCHOTT. *Metall u. Erz* **24**, 331–8; *Chem. Zentr.* **1927**, II, 1509.—The chemistry of the process is described together with its technical applications and plant calcns. J. S. REICHERT

Some cases of amalgamation of gold ores. I. PLAKSIN. Univ. Vladivostok. *Arbeiten d. I. Konferenz zur Erforschung von Naturkräften des fernen Ostens* **1927**, 165–78; *Chem. Zentr.* **1927**, II, 2423.—Since river water is not available in the Far East, spring water with a high salt content is often used in the amalgamation of Au ores,

which results in the formation of amalgams contg. Fe and in large losses of Hg. It is shown that sea water is preferable C. C. DAVIS

Recovery of fine gold by amalgamation. EDMUND S. LEAVER. Bur. of Mines, *Information Circ.* No. 6081 (Aug., 1928).—In addn. to accurate assays of representative samples an expert microscopic examn. and report on minerals present and how associated are needed before methods of recovery can be recommended. Loss of "float gold" is due to lack of contact with Hg. Improved recovery can be obtained by a thinner pulp and by introducing swinging amalgamated plates as obstructions to the pulp flow. Improved recovery of "rusty gold" can be obtained by abrasion, grinding or by use of grease-removing chemicals. Fine Au in pyrite or tellurides does not readily amalgamate. The roasting of pyrite concentrates and tellurides improves this condition but does not insure high recovery. To effect amalgamation each particle of Au must come into contact with the Hg. To do this crushed ore and water may be passed over the amalgamated plates in a thin layer and by providing for a drop from each plate to the next in a series. Careless introduction of oils and greases, presence of soluble sulfides, As and Sb all prevent good amalgamation. Cyanidation is usually resorted to for recovering Au lost in amalgamation processes. H. C. PARISH

Gold and silver. M. W. VON BERNEWITZ. *Mineral Ind.* **36**, 213–68(1927); cf. *C. A.* **22**, 51.—Production in the U. S. and the world, prices and metallurgy are discussed and statistics given. A. B.

Speiss and the metals of the platinum group. H. RUSDEN AND J. HENDERSON. *J. Chem. Met. Mining Soc., S. Africa* **29**, 5–10(1928); cf. *C. A.* **22**, 2130, 3610.—A discussion by J. P. Bearswood brought out a method whereby the total platinoids and Au and Ag may be fairly accurately detd., also a few points on the behavior of speisses toward the various platinoids. Several "dry" and "wet" processes giving low results are outlined and a dry method is described which apparently successfully combats the presence of large quantities of NiO in the cupel, loss of Os during cupellation, and splaying of the metals on the cupel. One-half A. T. of speiss is fused with 1 A. T. soda, 1/4 A. T. borax, and 3–4 A. T. red lead. A low flame used at the start is gradually raised. After washing with litharge and reducer the melt is poured. After sepn. of slag and Pb button the slag is re-fused with borax and a mixt. of litharge and sufficient reducer to give a 20 g. button. The 2 Pb buttons are twice scorified with red lead and borax and once with borax only. This treatment removes Ni and Cu. Contrary to the general opinion, the platinoids occurring in speiss show no tendency to settle to the bottom of the Pb. The cleaned button is cupelled with an addn. of 3 g. of Ag, starting at a high temp. which is gradually lowered so as to procure a spongy bead when all Pb has been removed. Parting with HNO_3 is followed by removal of Ag by HCl from the filtrate and elimination of HNO_3 by successive evapns. with HCl, the platinoids are pptd. by Zn onto Pb, filtered, washed, scorified with Pb and borax, the button is cupelled with Ag, and the bead parted with H_2SO_4. The parted bead consisted almost entirely of Pt but did not constitute the total Pt of the speiss. The platinoid value may be obtained with fair accuracy by detg. the Au and deducting from the total. The Au may be detd. in several stated ways. Exptl. results on the behavior of speiss toward the platinoids in S. African Pt ores indicate that the use of *speisses as collectors of Pt ores* is unwarranted. Speisses of As and Sb are excellent collectors of the Os, Ir and Ru, but not of Pt and Pd. While the exptl. results are higher than those of other workers they represent only about 95% of the true content of the speiss, due to the drastic treatment, slight losses during ignition of the metals and on fusion with $KHSO_4$. W. H. BOYNTON

Platinum. GEORGE F. KUNZ. *Mineral Ind.* **36**, 461–76(1927).—World production and technology are reviewed and a bibliography is given A. B.

Metallurgy of lead in 1927. OLIVER C. RALSTON. *Mineral Ind.* **36**, 367–72 (1927).—A review. A. B.

Lead. REIGART M. SANTMYERS. *Mineral Ind.* **36**, 340–66(1927).—The industry in the U. S. and foreign countries is reviewed, with statistics. A. B.

Recovery of arsenic and tin in the Harris process of lead refining. R. WINTER. *Eng. Mining J.* **125**, 893–7(1928); cf. *C. A.* **22**, 3120, 3267.—Sn and Sb are in the form of cryst. oxy salts after sepn. of the free NaOH. The cryst. cake is treated with hot water, free from lime. The quantity of water depends upon the compn. The resultant soln. should contain 10% of combined plus free alkali. Insol. Na antimonate is sepd. by decantation. Sn and As are recovered in 3 steps: (1) pptn. of Sn by $CaCO_3$ and sepn. of Ca stannate; (2) partial causticization of the resulting soln. with lime and sepn. of $CaCO_3$; and (3) pptn. of As with lime and sepn. of Ca arsenate from the resulting 10% soln. of NaOH, which is used for dissolving fresh quantities of spent molten reagent

obtained from the dry operations. Usually the Na stannate is electrolyzed. A small % of As does not affect the efficiency of the electrolysis, but small quantities of impurities are removed by the addn. of Na_2S. Illustrations include the continuous pptn. app. for Sn and As, a special crystallizer for cooling slurry, and the app. for evapg. mixed NaOH and NaCl soln. and melting the product. W. H. BOYNTON

Refining of zincky lead by the Harris process. R. WINTER. *Eng. Mining J.* **125**, 969–70(1928); cf. preceding abstr.—The removal of Zn and the last traces of Sb are discussed and the advantages of the process as a whole are summarized. NaCl is the principal reagent and no solid oxidizer is employed. The molten mixt. of NaCl and NaOH is charged into the reaction cylinder of the machine and circulation of the zincky Pb continued until elimination of Zn and Sb is complete. Na_2O is produced at the expense of NaCl, and Na_2CO_3 is evidently converted to NaOH. Working temps. vary from 390° at the beginning to 460° at the point where elimination of Zn is complete and Sb is being removed. The liquid mass in the working cylinder of the machine is dissolved in strong wash water contg. NaOH and NaCl from a previous operation. The same soln. is used repeatedly till the sp. gr. is 1.35. Pb granules are sepd. and the soln. contg. ZnO in suspension goes to a storage tank where it settles out and the liquor is decanted to the evaporator. The ppt. taken up with water and filtered or the hot liquor is pumped through a heated filter press of the washing type. The Zn cake has: Zn 72–76, Pb 0.2–0.5, and Sb 1–1.5%. Advantages of the process are: low labor and fuel costs, automatic and continuous operation, also the elimination of dross and flue dust treatments and lower metal losses and interest charges. All the Ag and Pb are removed in the primary refining operations. High recoveries of impurities in a marketable form are obtained. W. H. BOYNTON

Manganese. CHAS. H. BEHRE, JR. *Mineral Ind.* **36**, 383–95(1927).—A discussion of production and trade, with notes on technical developments and a bibliography. A. B.

Quicksilver. H. W. GOULD. *Mineral Ind.* **36**, 514–21(1927).—Market, production and technology are discussed. A. B.

Molybdenum. ALAN KISSOCK. *Mineral Ind.* **36**, 401–4(1927).—Progress in the production and use of Mo is outlined. A. B.

Utilization and prevention of molybdenum waste in oxidized lead ore treatment. R. E. HEAD AND VIRGIL MILLER. Bur. Mines, *Repts. of Investigations* No. **2888**, 3 (1928).—Tests were made on a wulfenite ore from the Stardistrict near Milford, which had for its object the sepn. and recovery of the Pb and Mo in sep. products. Microscopic examn. showed that the samples used in the work were composed of wulfenite, plumbojarosite and a small quantity of cerussite. The ore assay showed Pb 16.66, Mo 3.96 and Fe 33.2%. One hundred g. of the ore, ground to 60 mesh, was mixed with 10 g. NaCl and heated for 1½ hrs. at 800–850°. The resultant calcine contained Pb 1.23, Mo 4.98 and Fe 41.0%, and was in a fine state of division. Seventy g. of the calcine were mixed with equal parts of fine coke (8 mesh) and placed in a graphite crucible. This charge was heated at approx. 1000° for 1 hr. About 25 g. of metal in the form of globules were removed by means of a magnet from the cool charge. The pellets contained Fe 87.5 and Mo 11.0%. The results of the test indicate that the method of treatment described can be applied to ores of this type and constitute a procedure by which the waste of Mo is eliminated. DOWNS SCHAAF

Nickel. THOS. W. GIBSON. *Mineral Ind.* **36**, 407–14(1927).—A review, including sources, production, technology and uses. A. B.

Tin. E. BALIOL SCOTT. *Mineral Ind.* **36**, 561–83(1927).—A statistical review of the industry, with notes on smelting. A. B.

Tungsten. COLIN G. FINK. *Mineral Ind.* **36**, 591–604(1927).—An outline of world production and new developments in technology. A. B.

Metallurgy of zinc in 1927. W. R. INGALLS. *Mineral Ind.* **36**, 629–33(1927).—A review of recent progress. A. B.

Zinc. JESSE A. ZOOK. *Mineral Ind.* **36**, 605–29(1927).—Production and trade in the U. S. and world output are discussed. A. B.

The metallurgical processes in connection with the manufacture of zinc-containing materials following the milling process. F. JOHANNSEN. *Metall u. Erz* **24**, 249–51; *Chem. Zentr.* **1927**, II, 734.—Materials contg. ZnO are mixed with coke, and gradually heated to 1200° in a rotary tube furnace in which the ZnO is reduced to Zn and vaporized. The vapors are converted back to ZnO by the addn. of air. The ZnO smoke is caught on filters as a very pure product. The filtration is effected by elec. pptn. or with bag filters. J. S. REICHERT

The Iron and Steel Institute in Spain. ANON. *Engineer* **146**, 348–51(1928).—

An illustrated account of *Sociedad Española de Construcciones Babcock and Wilcox*, of *Compania Minera de Setares* and of *Sociedad Anonima Echevarria*. D. B. DILL

Iron and steel. OLIN R. KUHN. *Mineral Ind.* **36**, 284–339(1927).—A review of world production and trade, also new metallurgical developments. A. B.

Notes on processes for the production of steels. ANTONIO PIOMELLI. *Rass. min. met. ital.* **68**, 77–83(1928).—A review of the development of modern processes, with special reference to the Bessemer process. C. C. DAVIS

Classification of iron and steel scrap. R. M. HUDSON. Bur. of Standards, *Simplified Practice Recommendation* R58–28, 23 pp.(1928). E. J. C.

Composition of burnt gases. J. SEIGLE. *Tech. moderne* **20**, 569–73(1928); cf. *C. A.* **16**, 3622; **17**, 1939.—A mathematical discussion of the possibility of a complete analysis of burnt gases. P. THOMASSET

Blast-furnace gas as condition indicator. ANON. *Iron Age* **121**, 1686–7(1928).—A discussion of the interpretation of some practical features of blast-furnace gas and the relation these features bear to the chem. and metallurgical reactions going on inside the furnace. H. C. PARISH

Production of high-alumina slags in the blast furnace. T. L. JOSEPH, S. P. KINNEY AND C. E. WOOD. Bur. Mines, *Tech. Paper* No 425, 32 pp.(1928).—See *C. A.* **22**, 1561. H. C. PARISH

Cyanogen and its compounds in the blast furnace. WILLI HAUFE AND HORST VON SCHWARZ. *Archiv Eisenhüttenwesen* **1**, 453–66(1928); cf. *C. A.* **22**, 1309.—These studies are made from considerations of the literature, it being found that differences of opinion are present as to the formation of $(CN)_2$ and HCN in the blast furnace (I). Calcns. using Nernst's approximation formula show that no $(CN)_2$ (in agreement with answers to a questionnaire sent to German I operators) and only small quantities of HCN (unstable) are formed at I temps. A mechanism is given for the formation of cyanides in **I**, it being noted that KCN and NaCN are formed in the hottest parts, while in the cooler upper zones $Ba(CN)_2$ and $Sr(CN)_2$ are formed. The alkali and alk. earths are introduced in large amts. in the ore and fuel. It is assumed that KCN rather than K_2C_2 and K_2CN_2 are formed. All other cyanides (HCN included) formed in I result from secondary reactions with KCN. The 4TiN.TiC present is due to a reaction between Ti, C and N_2, the temp. and pressure playing an important part. This is not a decompn. product of nitrides, nor is KCN instrumental in its production. J. BALOZIAN

The spathic iron ore roasting of the San Fernando mine at Herdorf (Siegerland, Germany). A. WEYEL. *Stahl u. Eisen* **48**, 14–5(1928); cf. *C. A.* **22**, 1748.—A new roasting plant at Herdorf is described. The rectangular shaft furnaces of stone, with well-insulated walls, roasting 58 to 60 tons per 24 hrs. require 2.25% coke or 157,000 kg. cal. Furnaces of the old type used 4.5 to 5% coke. J. A. SZILARD

Shaft flame furnaces in foundries, especially with oil firing. SKAMEL. *Feuerungstech.* **16**, 66–7(1928).—S. describes a cupola with a double hearth, in which two different products may be made, or successive steps in purification carried out. E. W. T

High-temperature crucible furnaces. WILLIAM MASON. *Metal Ind.* (N. Y.) **26**, 392–3(1928).—The design and construction of high-temp. crucible furnaces are discussed. Coke is used as fuel. J. W. BOECK

Refractories and the open hearth. J. R. MILLER. *Blast Furnace & Steel Plant* **16**, 807–8(1928).—Severe service conditions make the refractory problem one involving not only material quality, but the utmost care in construction and use. The roof is of prime importance and should be properly seasoned. Next in importance are the front and back walls. J. W. BOECK

Why tilting furnaces are better. CARL W. PIERCE. *Iron Age* **122**, 693–4(1928).—A more uniform product, greater tonnage and a more economical operation are obtained by the use of a tilting open-hearth furnace as against the stationary type. With the tilting furnace it is possible to remove an unsatisfactory slag and make a new one by the addition of burnt lime. Due to the position of the tap hole in the tilting furnace slow hard taps are eliminated. There is less danger of breakouts in fronts and ends and less bottom trouble in the tilting furnace. The conversion cost in a plant using both stationary and tilting furnaces showed the tilting furnace to be operating at about 80 cents a ton lower than the stationary. DOWNS SCHAAF

Basic open-hearth practice. G. B. WATERHOUSE. Mass. Inst. of Tech. *Blast Furnace & Steel Plant* **16**, 766–9, 922–5(1928).—The process and its history are briefly described. Statistics are given to show the status of the process in the U. S., Great Britain and Germany. The reason for the supremacy of the basic open-hearth process is its ability to deal with raw materials that vary greatly in compn., particularly as to

the amt. of P and large amts. of scrap. Attention is drawn to the great variety and kinds of steel made by this process. The process is not dependent upon one kind of fuel. Prepd. dolomite is being used for refractory purposes, especially in hearth repair. Dead burned imported magnesia is still the standard material for putting in new bottoms. J. W. Boeck

Steel plant waste heat boilers. R. G. Stevens. Bethlehem Steel Company, Johnstown, Penna. *Blast Furnace & Steel Plant* **16**, 931–5, 1050–3(1928).—S. calls attention to the modifications in existing conditions that must be considered in connection with such an installation. The performance of the boiler is secondary to the effect upon the furnace to which it is attached. The possibilities, limitations and location of such boilers are discussed. Explosions produced at each reversing of the valves are particularly severe when a waste heat boiler is inserted between the regenerators and stack. Preventive measures and provisions for these explosions are given. The induced draft fan and method of driving are discussed. The advantage of dry sealed valves, insulated gas flues and types of boilers are pointed out. The justification of a waste heat boiler must be considered, as complete utilization of heat by the primary heating unit promotes economies in excess of those represented by the performance of the boiler. J. W. Boeck

The rehabilitation of rolling-mill equipment in British steelworks. G. A. V. Russell. *Engineering* **126**, 243–5, 274–5, 379–81(1928). E. J. C.

Cold working of ingot iron and steel by drawing. Günter. *Metallborse* **17**, 1573–4, 1629–30, 1685–7, 1741–2, 1911–2; *Chem. Zentr.* **1927**, II, 2225.—A comprehensive report on the refining of metal by cold working. C. C. Davis

Investigations on slags thinly liquid below 1000°; the influence of zinc oxide as a constituent on their viscosity. Helmut B. Wendeborn. *Metallbörse* **18**, 258–9 (1928).—The viscosities of the molten slags are detd. by measuring the elec. work done by a motor in driving a stirrer in the melt, these quantities being approx. proportional to each other. The compns. and properties of 6 slags, fluid below 1000°, are tabulated and compared with values for the same slags contg. ZnO. The temp.-viscosity diagrams of 4 of the slags are plotted, being hyperbolas for homogeneous substances. *Ibid* 426–7.—Up to 20% ZnO may be used in slags, fluid below 1000°, those contg. higher percentages being fluid only at considerably higher temps. Borax in the presence of Fe_2O_3 increases the soly. of ZnO in slags to a high degree. CaO and BaO (up to 2%) promote the fluidity of slags in an extraordinary manner. K_2O, MnO, Al_2O_3, PbO and SiO_2 (above 50%) are undesirable components of slags. Temp.-compn. curves of 2 slag mixts. are plotted for const. degrees of viscosity. For the thinner slag mixts., these show eutectics having about the same compns. With the aid of such curves, the slag compn. for a given temp. and viscosity may be predetd. J. Balozian

The most important properties and the theory of flow-figures. Itiaro Takaba and Katumi Okuda. Mitsubishi Labs., Nagasaki, Japan. *Archiv Eisenhüttenwesen* 1, 511–5(1928).—Expts. are made to answer some of the obscure points regarding flow-figures (I). The focus of I and the directions in which it broadens out are detd. by first making transverse bending tests on mild ingot steel bars, then heating to 200° for 30 min. in a furnace and cooling in the same, and finally etching with Fry's reagent. For studying the strain directions, on loading, in the interior of the specimens, a celluloid model in conjunction with Coker's optical method is used. The magnitudes of the thrust-strains (II) are detd. with a bakelite bar, instead of one of celluloid. The tests show that flow-streaks appear first where II is greatest, and broaden out to where II is still commensurably great. In the middle of the bar the streaks coincide approx. with the largest II, although irregularly around the loading position. The flow-layers and the largest II coincide throughout. I are irregularly formed if the specimens are insufficiently annealed. In 5% Ni steel and 3% Cr-Ni steel I and the sudden break in the load-elongation line (III) can easily be detected, but with rust-free Fe and steel neither is obtained. The sudden break in III and the I result from the same cause. A theory to account for the origin of I is given, according to which, metals with body-centered lattices are more liable to show I than those with the face-centered. J. Balozian

The behavior and requirements of dolomite used in steel works. Otto Jacobs. *Stahl u. Eisen* **48**, 993–5(1928).—The various types of dolomite required in Thomas or Siemens-Martin mills are discussed and experiences with various brands are given. For the Thomas work the chem. compn., grade of sintering, granulation and tar content are of less importance than the use of a thinly liquid, "warm" pig Fe and the addn. of a CaO easy to melt with a low MgO content; the 2 last factors are of the greatest importance in order to obtain a fast and economical operation. For the Siemens-

Martin work it is of advantage to use a dolomite which contains originally some fuel or flux and well calcined in a revolving furnace, because by its use the life of the hearth is increased. J. A. SZILARD

A study of sulfur in the basic process. HAROLD A. GEIGER. *Blast Furnace Steel Plant* **16,** 1201-3(1928).—The desulfurization of blast furnace metal as influenced by the vol., compn. and temp. of the accompanying slag is described. D. S.

Zinc sulfide as an intermediate product of a smelter. W. STAHL. *Metall u. Erz* **24,** 312; *Chem. Zentr.* **1927,** II, 1339.—The observed crystals appeared in clusters on a darker background; they were wine-yellow, transparent, glassy, prismatic, striped, hexagonal bodies. Analysis: Zn 66.08, Fe 0.55, Mn trace, Pb 0.31, S 32.88. Density 4.32, hardness (Moos) 3-4, sol. in HNO_3 and aqua regia. J. S. REICHERT

The influence of carbon on the properties of cast iron. E. DIEPSCHLAG. *Giesserei-Ztg.* **24,** 418-20; *Chem. Zentr.* **1927,** II, 1754.—A review of the various forms in which C can occur in cast iron, *viz.*, graphite, temper C, coarse cementite and perlite, the causes governing the formation of these structural elements, their influence in metallurgical processes and their effects on the mech. properties. C. C. DAVIS

Silicon structural steel from the Bosshardt furnace. K. v. KERPELY. *Zentr. Hutten u. Walzwerke* **31,** 367-72; *Chem. Zentr.* **1927,** II, 1075; cf. *C. A.* **22,** 1563.—The production of Si steel in the Bosshardt furnace is described. The steels produced, in general, show a greater strength than the ordinary product from the Siemens-Martin furnace. J. S. REICHERT

Evidences concerning the location of the carbon atom in boydenite. H. A SCHWARTZ. *Trans. Am. Soc. Steel Treating* **11,** 277-83(1927); cf. *C. A.* **21,** 3872.—Boydenite is a soln. of C in γ-Fe in which one atom of C replaces one of the γ-Fe in the face-centered cubic arrangement and is different in kind from cementite (austenite). A solute atom of any kind can occupy either of 2 types of location in the lattice of a given solvent. W. A. MUDGE

The x-ray investigation of the formation of martensite. KOTARO HONDA AND SINKITI SEKITO. *Sci. Repts. Tohoku Imp. Univ.* **17,** 743-60(1928).—Two series of tests were made on 8 steels ranging from 0.202 to 1.075% C. In series *A* the steels were prepd. in the form of wire 1 mm. in diam., heated to the proper quenching temp. (880° for 0.202% C to 920° for 1.075% C), held at that temp. for 2½ hrs. and then quenched in water. Wires 2.5 mm. in diam. were used in the B series and were filed down to 21 mm. in diam. after quenching. The surface of the quenched specimen was directly exposed to the x-ray in the *A* series, while in the *B* series the surface layer was filed down and the interior of the quenched specimen was exposed to the same ray. The results of the tests show that the outer layer of quenched C steel contains a body-centered tetragonal lattice and the inner portion an ordinary body-centered cubic lattice. The former is identified with alpha martensite and the latter with beta martensite. The mechanism of the formation of martensites from austenite is explained on the basis of the space lattice; *i. e.*, the tetragonal lattice ($c/a = \sqrt{2}$) is first to be compressed uniformly in the direction of the *c*-axis and at the same time uniformly expanded in the perpendicular direction. Alpha martensite is obtained when the axial ratio of the tetragonal changes from $\sqrt{2}$ to 1.07 and beta martensite when the same ratio changes further to 1. DOWNS SCHAAF

X-ray studies of the structure of quenched carbon steel. G. KURDUMOV AND E. KAMINSKII. *Nature* **122,** 475-6(1928).—A great no. of specimens of C steel with the C content ranging from 0.64% to 1.44% were studied by x-ray analysis. The largest dimensions of the specimens were 10 × 10 × 15 mm., and the temp. of quenching varied from 1000° to 1100°. The x-ray study has shown that the tetragonal structure in all specimens exists not only on the surface but also within, at a depth of 5 mm. The presence of austenite was revealed in all specimens. The steels with 0.91 and 1.44% C gave more austenite when quenched in oil than when quenched in water. The present x-ray study shows that martensite can be considered as the solid soln. of the C in α-Fe. DOWNS SCHAAF

Effects observed in quenched liquid steel pellets and their bearing on bath conditions. J. H. WHITELEY. *J. Iron Steel Inst.* (advance copy), No. **8,** 13 pp.(Sept., 1928).—A spoonful of molten metal with a covering of slag is taken from the bath and poured from a height of 2 ft. into cold water 1 ft. or so in depth. Two or three of the pellets formed when the stream of liquid steel is broken up are mounted in Wood's alloy, ground, polished and etched *in situ* with either (1) a soln. of 5 g. of picric acid in 100 g. of 95% EtOH, or (2) Dufays reagent consisting of 100 g. of 95% EtOH, 10 g. of water, 1 g. of $CuCl_2$, 0.5 of picric acid and 1 to 3 g. of HCl. When examd. under

the microscope the particular features to be noted are: (1) sulfide particles, (2) slag and oxide inclusions, (3) gas cavities, (4) structural heterogeneity. Certain deductions can be made from the microscopic examns. of the pellets as to the bath conditions. Also in *Engineering* **126**, 472–4 (1928). DOWNS SCHAAF

A unique installation combining coal and oil firing of an annealing furnace. G. C. DAVIS. *Furnaces, Heat Treating and Forging* **14**, 89(1928).—To prevent the smoking of a coal-fired annealing furnace, a 3" oil burner (in conjunction with a small turbo blower) is so placed that it fires directly over the coal bed. When a green fire is made or fresh coal put on, the burners are turned on, thus doing away with smoke. It has been found that the cost of coal and oil is less than that of coal alone, and that the annealed castings have better properties. J. BALOZIAN

Contribution to the question of the amount of loss during heating in furnaces fired with coal dust. KURT RUMMEL. *Archiv Eisenhüttenwesen* **1**, 499–504(1928).—Since results on the heating loss (I) in coal-dust furnaces vary greatly, an investigation is made. The exptl. method is essentially the *block-process*, the loss in wt. of a small steel block being detd. before insertion and after withdrawal (1250–60° and 1290–1300°) from the furnace. Two series of tests are made: in one the block moves through the furnace in 1–2.2 hrs., and in the other stays in a given position for 1–4 hrs. The furnaces used are fired with hard coal dust, mixed gas (coke gas + hard coal-generator gas), brown coal dust, or brown coal dust + generator gas It is seen that the position of the block in the gas current strongly influences I. I increases as the time of the block in the furnace and, also, its temp. increase. Under av. conditions, I is the same in the coal-dust and gas-fired furnaces. For shorter times of passage through the furnace, the temp. of withdrawal of the block does not greatly affect I, while with greater times the influence of withdrawal temp. is considerable. With short times of standing in dust-fired furnaces (especially with ash-rich brown coal dust), I is greater than in the gas-fired, and is smaller for longer time. J. BALOZIAN

The decarburization of steel during heat treatment. M. BONZEL. *Aciers spéciaux* 2, 456–61(1926); *Chimie et industrie* **20**, 262(1928).—A discussion of the decarburization of steel in various gases at different temps., and of the precautions which should be taken to prevent it during heat treatment. A. PAPINEAU-COUTURE

Ethylene as gas fuel for welding. K. E. SKARBLOM. *Svensk Kem. Tids.* **40**, 119–25(1928).—An argument for the use of C_2H_4 in place of C_2H_2, H_2 or illuminating gas in welding, R R. signals, etc. The inner cone of the flame adjusted for welding is longer with C_2H_4 than with C_2H_2. C_2H_4 is made by heating EtOH vapor to 500°+ in the presence of kaolin, $AlPO_4$, ThO_2 or W_2O_5 Et_2O can be ruled out by proper catalysts and heat manipulation. Welding tests with C_2H_4 were satisfactory. A. R. ROSE

The change of elastic constant in metals caused by cold-working. KOTARO HONDA AND RYONOSKE YAMADA. *Sci. Repts. Tohoku Imp. Univ.* **17**, 723–42(1928).—Previous contradictory results as to the changes in Young's modulus of elasticity due to cold-working of metals are reviewed, and a theoretical analysis is given showing that this modulus must be diminished, like the d., by cold-working. Fe, steel, Cu, brass and Al were tested in tension, and the true elastic deformation was detd. as the difference between total and permanent deformation. By working with small loads, the stress-strain curves were studied near the origin. Single Fe crystals showed a decrease of 3% in the modulus, due to cold-working, which agrees with the theory based on the decrease in d. The modulus did not recover after low-temp. annealing of strained single crystals, although when annealed above 300° they softened; they showed no elastic after-effect when unloaded after a plastic deformation. The decrease in the modulus, due to cold-working, in ordinary Fe and other metals was 6 to 10%, and likewise agreed with the theory based on changes in d. The modulus recovered from the cold-working effect on aging for several hours or more quickly on heating up to 200°. The recovery was more difficult when working had been more severe. GEO. F. COMSTOCK

Recent investigations on the resiliency of metallurgical products at the experimental institute of the State railways. FORCELLA. *Riv. tech. ferrovie Italiane* **1927**, 31; *Rev. métal.* **25**(Extraits), 357(1928).—Resiliency tests on a large no. of rails, tires, coupling hooks and sheet metal were made on a Charpy 30-kg.m. machine with Mesnager test bars. The results showed that parts exhibiting normal elongation failed in service when the resiliency was low. By measuring the fragility of the most fatigued portion of the metal, it was observed that failure always took place when the resiliency was less than 0.5 kg. m., even though there was no localized defect; *e. g.*, the working surface of a rail which had failed in service, having a tensile strength of 80 kg. per sq.

mm. and elongation of 14% and free from local defects, had a resiliency of 0.3 kg. m., while the resiliency of the remainder of the rail was 1.5 kg. m. In order to obtain concordant results in the resiliency test, it is recommended that the test piece be taken so that the notch will be perpendicular to the plane of rolling. In all the tests which gave low resiliency, it was found that the results could be explained from the results of micrographic, macrographic or chem. examn. Investigation of the effects of a 3-mm. hole perpendicular to the notch of the Mesnager test bar showed that: (1) When the resiliency, detd. in the usual way, is 0.3-3.5 kg. m., the presence of the 3-mm. hole appreciably increases the resiliency (expressed in kg. m. per sq. cm.). (2) When the resiliency is approx. 3.5 kg. m., its value is not affected by the 3-mm. hole. (3) With resiliencies higher than 3.5 kg. m. (the tests were carried out on metals having resiliencies up to 24 kg. m.) the resiliency is decreased by the presence of a 3-mm. hole; the decrease becomes larger as the resiliency increases. A. PAPINEAU-COUTURE

Flow characteristics of bars and tubes, both pressed and drawn. HERMANN UNCKEL. *Z. Metallkunde* **20**, 323-30(1928).—The process of flow is first studied by pressing out bars from a plastic mixt. contg. beeswax, vaseline and chalk, arranged in differently colored layers. A block built up of alternate sections of Al and an alloy of Al contg. 1% Cu is then studied both in pressing and drawing and the nature of the flow is described. H. STOERTZ

Steel castings and pouring temperatures. A. TENIVELLA. *Met. italiana* **20**, 342-5(1928).—A discussion of the influence of the temp. of pouring on the quality of steels. Emphasis is laid on the desirability of avoiding high pouring temps. even with thin castings. C. C. DAVIS

The specific heat of iron below 400°. WM. H. DEARDEN. *Iron Steel Inst. Carnegie Scholarship Mem.* **17**, 89-108(1928).—The curve showing the relationship between the variations in the sp. heat of Fe and temp. plotted from the results of exptl. work, the vacuum calorimeter method being used, rises steadily up to a temp. of 100°, then there is an abrupt rise, followed by a somewhat slower fall to 180°, and then a smooth rise up to 400°. The cusp in the curve is quite marked, implying some phys. change taking place in Fe in the neighborhood of 115°. The result is shown to be in accord with abnormalities and discontinuities occuring in many other properties of Fe at about the same temp. DOWNS SCHAAF

The effect of oxygen on iron and steel. I. ANON. *Metallurgist* (Suppl. to *Engineer* **146**, No. 9) 116-8(1928).—A review of recent literature on the soly. of O in Fe and of methods of detg. O in steel. **II.** *Ibid* (Suppl. to *Engineer* **146**, No. 13) 130-2.—A review of the structure of O-bearing steels, of the removal of O by Mn and of the effect of O on phys. and elec. properties. D. B. DILL

The properties of silicon-carbon-iron alloys and a new theory of cast iron. D HANSON. *Giesserei Z.* **15**, 148-58(1928); *Iron and Coal Trades Review* **115**, 437-42(1927). —See *C. A.* **22**, 751. J. BALOZIAN

Apparatus and methods for measurement of the Hertzian hardness. R. ESNAULT-PELTERIE. *Engineer* **146**, 220-2(1928); cf. *C. A.* **22**, 4092.—The area of contact of two balls is estd. by measurement of elec. resistance to the passage of a current through the point of contact. It is shown that the theory of elec. resistance of 2 conductive bodies in contact justifies this method. D. B. DILL

The Rockwell hardness test. J. E. MALAM. Kynoch, Ltd., Birmingham, Eng. *J. Inst. Metals*, advance copy **472**, 20(1928).—Annealed strips of Cu, brass and Cu-Ni with 20% Ni, all $^1/_4$ in. thick, were cold rolled in various amts. up to 60% and were tested for hardness by the Rockwell, Brinell and scleroscope methods. Balls of $^1/_{16}$ in. and $^1/_8$ in. diam., resp., were used in the Rockwell machine, and a 3 mm. ball was used on the scleroscope hammer. The hardness values above 20% reduction by cold-rolling did not increase as much when measured by the Rockwell method as by the Brinell. A linear relation is shown between Rockwell nos. and reciprocals of the Brinell nos.; also between Brinell and scleroscope nos. The Rockwell machine as usually calibrated does not give as good a measure of the resistance to penetration of these cold-worked alloys as the Brinell method, and a new Rockwell scale agreeing with the Brinell nos. is suggested. Formulas for correlating the results of the 3 methods are proposed for some of the alloys, and discussed. Defects in the Brinell test, as reported by other investigators, are reviewed, and improvements suggested are the adoption of the projected area of impression as divisor in computing the no. and a correction for friction. The unstandardized nature of methods in use for hardness testing is unfortunate, and the situation might be corrected by a committee. The present arbitrary Rockwell scale is not considered suitable for worked non-ferruos alloys. G. F. C.

The relation between the pressure and the diameter of impression in hardness

test. KINNOSUKE TAKAHASI. *Sci. Repts. Tohoku Imp. Univ.* **17**, 843–56(1928).—Exptl. results in indentation hardness testing are given to show that under very small pressures the pressure will be proportional to the square of the diam. of impression. The app. consisted of an Amsler 5-ton tensile testing machine to which a 10 mm. Brinell ball was firmly attached, and a specially constructed instrument for measuring the depth of indentation. Tests were made by applying 5 to 100 kg. loads and measuring the depth for every 5 kg. up to 30 kg. and for every 10 kg. above 30 kg. on specimens of Al, Cu, Zn, brass and on annealed and quenched C steels contg. 0.1, 0.3, 0.5, 0.7 and 0.9% of C. DOWNS SCHAAF

X-ray investigation of the internal stress of carbon steels. SINKITI SEKITO. Tohoku Imperial Univ. Sendai. *Z. Krist.* **67**, 563–9(1928)(In English); cf. *C. A.* **22**, 2911.—The broadening of the spectral lines by the action of cold-working of C steel is similar to that of Cu (cf. *C. A.* **21**, 3589). C steel, cold-drawn to give a reduction of 1/4.3 in diam., shows a max. distortion of the space lattice of 0.4%. The calcd. internal stress of 84 kg./sq. mm. is slightly less than the tensile strength. Annealing at 400° releases most of this stress. L. S. RAMSDELL

Properties of materials at high temperatures. III. "Creep" of Armco iron. H. J. TAPSELL. Dept. Sci. Ind. Research, Eng. Research. *Spec. Rept.* No. **6**, 11(1928); cf. Tapsell and Clenshaw, *C. A.* **21**, 3333 —"Creep" tests made on Armco iron at 136° under a load of 25.7 tons per sq./in. showed that creep had practically ceased in 22 days. Stress-strain relations of specimens which had been creep-tested at 150°, 237°, 325° and 390° indicated that plasticity progressively decreased and the new limit of proportionality acquired by the material was at all temps. much greater than the value of the original material. It is considered that a hardening process occurs during creep similar to that taking place in the neighborhood of the slip planes during a fatigue test. B. C. A.

Influence of heterogeneity of structure on the appearance of the fracture and on the resistance of homogeneous iron and steel plates. RAFFAELLO ZOIA. R. Scuola d'Ingegneria, Torino. *Notiz. chim.-ind.* **3**, 571–6(1928); cf. *C. A.* **22**, 373.—Tests were made of 511 samples of homogeneous Fe and steel plates for reinforced concrete, including: (1) macrographic examn. of transverse sections after attack by various standard reagents; (2) examn. of the characteristics of fractured surfaces; (3) detns. of the tensile strength and elongation at rupture; and (4) detns. of the hardness (Brinell). The most interesting of the results are described, with photographic reproductions, the latter showing especially the effects of slag and blow-holes. C. C. D.

Strain effects in mild steel. HENRY S. RAWDON. *Eng. News-Record* **101**, 244–50 (1928).—An extensive discussion of strain in mild steel, its effects and detection. The changes corresponding to "yielding" under stress are very evident and may be demonstrated (*a*) by strain markings on polished surfaces or the flaking of oxide or other coatings, (*b*) by macroscopic etching with acidified Cu solns., (*c*) by microscopic examn. of polished surfaces subsequently strained, and (*d*) by hardness surveys. Stress beyond the yield point produces a progressively greater change in the appearance and structure of steel. The surface, which becomes completely free of any scale initially present, assumes a mat appearance, entirely obliterating the strain markings produced during the first yielding of the metal. The grain structure is greatly changed and a fiber like structure is approached with high degrees of straining. The corrodibility may be greatly increased as a result of permanent strain. R. E. THOMPSON

The influence of cold-hardening on the fragility of mild steel. PIERRE DEJEAN. Inst. Polytechnique de Grenoble. *Chimie et industrie* Special No., 337–42(April, 1928); cf. *C. A.* **21**, 3590 —The previously reported results on the effects of compression on fragility are given and compared with the effects of traction on the same steel. In the latter case the fragility increases with the elongation, finally reaching a value which remains practically const. irrespective of further elongation; but in no case is this const. fragility as high as the one caused by subjecting to a compression greater than the previously found crit. value. A. PAPINEAU-COUTURE

Hardness and its relation to the cold-working and machining properties of metals. II. HUGH O'NEILL. *Iron Steel Inst. Carnegie Scholarship Mem.* **17**, 109–56(1928); cf. *C. A.* **21**, 1787.—The nature of deformation by scratching is considered in detail and a description is given of the construction of a new form of sclerometer using a 1 mm hemispherical diamond, and its application to the study of directional hardness in both annealed and strained single crystals of metal. Indentation tests are considered in connection with the machining properties of metals and the Brinell value H_u (which is equal to $^1/_2$ the mean pressure per unit area required to give the max. amt. of deformation in the ball test) is more valuable than the normal Brinell no. in correlating

hardness with machinability. A distinct similarity is noted between curves connecting true stress with some function of strain, irrespective of whether deformation is produced by the tensile, compression or ball indentation tests. A stress called the "pressure of fluidity" is discussed and has a value twice as high as the *true* tensile breaking stress and bears an inverse relation to Richard's values of coeff. of compressibility. It is suggested that elastic plus plastic deformation must be utilized in the measurement of hardness, and a method is described in which this is done for the hardest of metals.

DOWNS SCHAAF

The change in tensile strength due to aging of cold-drawn iron and steel. L. B. PFEIL. *J. Iron Steel Inst.* (advance copy) No 6, 15 pp. (Sept., 1928).—The exptl work consisted in cold-drawing without annealing a series of steels of varying C content and of varying heat treatments, followed by tensile tests at different stages of reduction and at different lengths of time after drawing Annealed metal $^1/_2''$ in diam. was drawn from 6/0 S.W.G. to 16 S.W.G without annealing, each die decreasing the diam. by approx 1 gage no. The drawing was carried out at the very slow rate of 3″ per min. The material tested contained 0.11% C, 0.006% Si, 0.70 Mn, 0.028% S, 0.016% P and lower C content metal was produced by heating the 0.11% C stock in H for different time periods. By using the tensile test as a measure of the capacity of the metal to undergo age-hardening after cold-drawing, it is shown that this phenomenon is chiefly due to the presence of C. C-free Fe is not subject to aging, but Fe contg. as little as 0.0025% C shows well-developed aging Since Fe contg. FeO also exhibits this phenomenon it is suggested that both C and FeO are sol. to a small extent in ferrite at ordinary temps., but that the soly. is less in distorted crystals, with the result that hardening and strengthening of the "duralumin" type occur after cold drawing. Also in *Engineering*, 126, 439–41(1928).

DOWNS SCHAAF

Magnetic method for the determination of the elastic limit of iron and steel. B. A. HOWLETT. Rose Polytech. Inst. *Proc. Indiana Acad. Sci.* 37, 240–4(1927) —H. gives a summary of thesis work done by Victor E. Schlossberg and P. E. Duffendach. Samples of steel and wrought iron were subjected to a tensile stress while under the influence of a fairly strong elec. field and the change in flux was measured. At the yield point of materials abrupt changes occur in the stress-strain curves and correspondingly abrupt changes were observed in the rate of change of flux at the true elastic limit in the samples under the stated conditions. D. used the method for malleable cast iron. Here there were a number of peaks but the first peak was taken to correspond with the elastic limit.

S L B. ETHERTON

The magnetic and electrical properties of cast iron. J. H. PARTRIDGE. *Iron Steel Inst. Carnegie Scholarship Mem.* 17, 157–90(1928).—Exptl tests prove that addn of Si to cast Fe decreases its magnetic induction and its remanence, and when present in amts. not exceeding 5%, it also decreases its max. permeability. Co increases the magnetic induction, remanent magnetism, and max. permeability of cast Fe, the high induction being due to the graphite existing in a very fine state of division. The addn of Ni decreases the magnetic permeability of cast Fe to such an extent that it becomes practically non-magnetic when about 15% of this element is present. P does not seem to have any marked effect on the permeability or induction of cast Fe. C has a very marked influence on the magnetic properties of cast Fe. If present as graphite in the nodular form, high induction is obtained, if in the form of flakes the Fe possesses low magnetic induction. If the ground-mass is ferrite, low hysteresis loss and high permeability appear to be fundamental properties of the material. If the Fe has a pearlite matrix it will also possess high hysteresis loss and comparatively low permeability The higher magnetic induction and permeability are obtained with cast Fe which has been annealed.

DOWNS SCHAAF

Testing machines for measuring the strength of metals. W. DEUTSCH AND G. FIEK. *Z. Ver. deut. Ing.* 72, 1173–82(1928).—A description of machines for testing the resistance of metals to tension, compression, bending and impact.

H. S. v. K.

What is fatigue? K. LAUTE AND G. SACHS. *Z. Ver. deut. Ing.* 72, 1188–9(1928).—The authors tested a number of Ni bars in a high-frequency alternating stress machine and found that, for a given amplitude of deformation, the number of revolutions to produce rupture is decreased by interposed annealings for half an hr. at 750°. It is assumed that a gradual disruption of atomic cohesions leads to the formation of macroscopic cracks.

H. S. v. K.

Resistance to fatigue and to shock and hardness of certain nickel and chrome steels for gears. A. HULTGREN. *Ing. Vetensk. Akad. Handl.* No. 59, 1–55(1927); *Chimie et industrie* 20, 264(1928).—A study of the properties required of steels for

automobile gears and the most suitable heat treatments, including the usual mechanism of the defects which develop in gears, the nature and distribution of the strains in the teeth of the gear, and the danger of fissuring and % of deformation during heat treatment. The suitability of certain Ni and Cr steels for the purpose was studied by means of fatigue (torsion), shock and hardness tests of a no. of cemented, oil-quenched or air-hardened steels. For parts subjected to repeated or alternate strains, but not to severe shocks, cemented Ni and Cr steels were found to be the best; next came oil-quenched steels (which should preferably be polished after heat treatment); while the air-hardened steels were inferior to the others. A. PAPINEAU-COUTURE

Replacement of tension and torsion tests of iron and steel wires by a ball compression test. BERNWARD GARRE. Techn. Hochschule, Danzig-Langfuhr. *Zentr. Hütten- u. Walzwerke* **31**, 557–59; *Chem. Zentr.* **1927**, II, 2537.—Expts. show that in many cases under certain conditions tension and torsion tests can be replaced with sufficient precision by measurements of the max. diam. of a compression made by a spherical ball on the wire. C. C. DAVIS

The use and interpretation of the transverse test for cast iron. J. G. PEARCE. *J. Iron Steel Inst.* (advance copy) No. **5**, 18 pp. (Sept., 1928).—By casting and testing cylindrical transverse test bars conforming to British Eng. Standards Specification No. **321**, of varied sizes and compns., it is possible to chart relations between size and strength, and between compn. and strength. The transverse rupture modulus increases continuously as the test-bar diam. diminishes until the point is reached at which the metal ceases to be gray. The size-strength curve is a useful index to the behavior of cast iron in thick sections, and the compn. strength curve obtained from a series of these should be of great assistance both to the designer of cast-iron structures and to the foundryman. P. hopes the expression of transverse strengths as rupture moduli will become general. DOWNS SCHAAF

Structure and strength of cast iron. G. NEUMANN. *Stahl u. Eisen* **47**, 1606–9 (1927).—The tensile strength, hardness and microstructure of gray cast iron as cast, after annealing at 850° and quenching in oil, and after quenching and annealing at 600–650° have been examd. The results confirm Bardenheuer's observations (*C. A.* **22**, 373) that the distribution of the graphite plays a far greater part in detg. the mechanical properties than does any other micro-constituent. The nature of the ground mass has an effect only on the hardness, its effect on the tensile strength being masked by the action of the graphite. The highest tensile strength is obtained with the min. amt. of graphite, provided it is evenly distributed throughout the metal in the form of fine flakes. B. C. A.

The tensile properties of tempered cast iron. RUDOLF STOTZ. *Giesserei Z.* **15**, 145–8(1928).—Standards for the min tensile strengths and % elongations of white and gray tempered cast Fe, as proposed by the "Verein Deutscher Tempergiessereien," are found by expt. to be too low. J. BALOZIAN

The qualitative and economic importance of acid steel casting, especially acid electro-casting. VIKTOR ZSÁK. *Giesserei-Ztg.* **24**, 413–7; *Chem. Zentr.* **1927**, II, 1754.—A study of the problem of the economy of production of steel by the acid process, with a crit. evaluation of the properties of the products. It is shown that for steel castings with an allowable P content not over 0.05%, the basic process is in general preferable, and that with an allowable P content not over 0.075% either process is superior economically in all cases where the finished casting may contain 0.1% P. C. C. DAVIS

Some properties of cold-drawn and of heat-treated steel wire. S. H. REES. *J. Iron Steel Inst.* (advance copy) No. **7**, 16 pp. (Sept., 1928).—The effect of low-temp. heat treatment on the mech properties of cold-drawn Cr-V steel wire contg. C 0.42, Cr 1.11 and V 0.20% are shown in tables and curves. The microstructure of the cold-drawn steel showing highly distorted ferrite and sorbitic pearlite drawn out in a longitudinal direction was not changed until a temp. of 450° was exceeded, when a slight coalescence of the carbide took place. Heating into the crit. range (750°) and cooling in air gave troostite and sorbite, and heating to a higher temp. (900°) resulted in a structure of acicular ferrite and sorbitic pearlite. Heating the cold-drawn material increases its density; the increase occurs principally after heating at 600° and above, the density after reheating to 750° was 0.33%. Tables showing the effect of preliminary low-temp. heat treatment on the loss of tension and on permanent set at various temps. are included. The complete restoration of elasticity at atm. temp. requires a treatment at 300° for the Cr-V steel, and other changes which occur on low-temp. heat treatment are comparable in extent when the Cr-V wire has been heated at a temp. about 100° higher than that applied to the C steel wire. Under high stresses

at raised temps., oil-hardened and tempered wire is decidedly inferior to cold-drawn and low-temp. heat-treated wire of the same compn. DOWNS SCHAAF

The properties of cast iron at low temperatures with special regard to cast-pipes and cast-pipe conduits. C. PARDUN AND E. VIERHAUS. *Giesserei Z.* **15,** 99–102(1928).—An attempt was made to find the reason for the occasional fracturing of large Fe castings at freezing temps. In the present research bending, breaking, impact and hardness tests were made on machine castings, cast-pipes, hematite castings and Fe to be used in thin-walled castings, at 0°, —20°, —35°, —80° and —180°. There is no appreciable change in these properties between 0° and —80°, whereas at —80° and —180° there is considerable increase in all of them with decrease in the temp., excepting the impact strength which decreases. These results show that the fracturing of Fe castings cannot be due to a slackening in their tensile properties, but rather to strains set up during contraction in the cold air, or in the cases of conduits, in the frozen earth bed. J. BALOZIAN

Case-carburization in presence of ferro-silicon. R. C. SPENCER AND E. G. MAHIN. Univ. of Notre Dame. *Proc. Indiana Acad. Sci.* **27,** 265–9(1927).—A general discussion. S. L. B. ETHERTON

Diffusion of hydrogen in iron. E. G. MAHIN. Univ. of Notre Dame. *Proc. Indiana Acad. Sci.* **37,** 272–6(1927).—Metals, especially when molten, may dissolve gases and during crystn. blow holes may be produced as a consequence. Iron rolled into sheets becomes coated with oxide and the sheets require pickling in HCl or H_2SO_4 to remove the scale. The concn. of the acid, the temp. and the duration of treatment should be such as will remove all the oxide but have the least attack on the free iron. However, some attack on the iron occurs and H is evolved. At ordinary temps. mol. H will not dissolve in Fe but during pickling, when atomic H is evolved, the gas dissolves and ultimately diffuses through the iron sheets. The metal must be annealed to remove the gas or it will be brittle and small blisters may appear during the coating process. A corresponding effect is thought to occur in steam boilers, the H evolved from the alk. waters being absorbed in the ferrite of the shell. Edwards found that for 0.1 *N* acid the rate of soln. and diffusion of the H through a clean sheet of hot rolled mild steel was inversely proportional to the temp. and the rate of diffusion increased rapidly with increasing concn. of H_2SO_4 from 5 to 15% and thence slowly. Edwards' theory is that atomic H dissolves in the steel and on reaching the outer surface combination of the atoms takes place so that mol. H escapes. A discontinuity of the metal causes gas pressure; hence the blisters. Such pressures may be high, for Cailletet has shown that diffusion occurs against 14 atm. pressures. M. used the tops of test tubes, de Khontinsky cemented to a steel strip, the under side of which had been polished and etched for microscopic examn. and lightly smeared with petrolatum. With H_2SO_4, bubbles like vortex rings were observed on the under side in 2 hrs. Apparently, the conclusion of Edwards is correct, *i. e.*, that there is no preferential path of gas travel, which would not be expected if the gas preferred amorphous grain boundaries. S. L. B. ETHERTON

The decomposition of the austenitic structure in steels. RALPH L. DOWDELL AND OSCAR E. HARDER. *Trans. Am. Soc. Steel Treating* **11,** 217–32, 391–8, 583–606, 781–90, 959–74(1927); **12,** 51–68(1928).—Commercial alloy, plain C steels and special lab. steels were used. Many photomicrographs are presented. *I. Decompn. during normal quenching.*—High C, alloy steels give increased quantities of austenite on quenching in oil from a high initial temp. rather than from normal quenching temps. Drastic quenching produces martensite at the edges. *II. Decompn. in liquid O.*—Submersion in liquid O_2 gave nearly complete decompn. for C steels and little or no decompn. with Mn and high-speed steels. More martensite may be produced at the interior than at the surface. Martensite forms at a rapid rate and immediately after submersion. Microstructures are similar to those from normal quenching and indicate a recrystn. phenomenon which shows itself first along slip planes and is accompanied by an increase in hardness and a decrease in density. *III. The effect of drawing or tempering; normal stresses.*—The decompn. temp. for austenite is always higher than for martensite in the same or similar steels. In C steels the martensite needles show progressive darkening at 100° as time and temp. are increased and indicate a slow pptn. of carbide until troostite is formed. Alloy steels behave similarly but are more stable and require higher temps. and longer time. Nodular troostite usually forms at grain boundaries, along slip planes or along martensite, cementite or troostite patches. *IV. Effect of stress.*—Martensite was produced from austenite by tensile but not by bending or upsetting stresses. Deformed austenite is rendered less stable on heating or on cooling. *V. X-ray studies.*—The General-Electric x-ray app. was used. Transformations

producing martensite give α-particles which are too small to be recorded on a crystallogram. C is held within the space lattice and does not replace the Fe atoms. X-ray results supplemented and confirmed mech. and microstructural data. *VI. Proposed theory for hardening and tempering steels.*—Austenite forms by soln. reaction between ferrite and carbide. Holding at temps. above the critical point causes grain growth. All com. rates of cooling produce unstable conditions and result in the delayed appearance of pptn. and transformation of phases. Recrystn. continues during aging. Tempering of austenite involves recrystn. from γ- to the α-lattice. Carbide particles grow in contact with the α-lattice and through the α-lattice as the solvent.

W. A. MUDGE

The influence of pearlitization below the AR_1 point on the mechanical properties of carbon steels. JOAQUIN ORLAND. *J. Iron Steel Inst.* (advance copy) No. **4,** 8 pp. (Sept., 1928).—Comparison is made of the mech. properties of lamellar pearlite in normalized steel with very fine globular pearlite obtained by tempering a series of C steels, the C content varying from 0.15 to 1.05%. On tempering quenched steel a finely granular pearlite is obtained, which gives to the steel both a tensile strength and an impact resistance greater than that given by lamellar pearlite in annealed steel. The best tempering temp. is given as 500° for the low C content steels, and 580° for the higher percentages of C.

DOWNS SCHAAF

The influence of varying strains and annealing temperatures on the growth of ferrite crystals in mild steel. C. A. EDWARDS AND TAKETO YOKAYAMA. *J. Iron Steel Inst.* (advance copy) No. **2,** 23 pp. (Sept., 1928).—The influence of varying degrees of cold-work, annealing temps. and annealing times upon grain growth in mild steel was investigated. Cold-drawn steel in the shape of 1/2" rounds was used for the tests, the bars contg. 0.08% C, trace of Si, 0.30% Mn, 0.032% S and 0.018% P. After normalizing by heating at 950° for 1/2 hr. in an atm. of coal gas, the bars were strained from 4 to 14% elongation, in steps of 0.5 to 1.0%. Pieces 1" long from the strained bars were wrapped in thin sheet metal and annealed in an atm. of coal gas at temps. ranging from 600 to 920° for periods of time varying from 2 hrs. to 7 days. The crit. strain for max. growth for an annealing temp. of 500° was 10%, for 600°—8%, 675°—6%, 700°—5% and for 725°—4%. The results of the tests prove that the higher the annealing temp., providing the straining corresponded with the crit. degree, the larger were the crystals, but they required a longer time to grow. Strains less than the crit. amts. followed by annealing did not cause crystal growth. As the degree of straining was increased above the crit. amt. the smaller were the crystals that were grown. Very severe strains caused recrystn. The longer the period of annealing and the higher the temp. up to A_1 point, the larger were the ferrite crystals formed. Other things being equal, the higher the temp. above the A_1 point, the smaller were the crystals produced. More extended crystal growth took place in the direction of straining than in the transverse direction. The growth of columnar crystals at or below 725° is due to the combined influence of cold-work and decarburization.

DOWNS SCHAAF

The gaseous cementation of iron and steel. IV. The action of mixtures of carbon monoxide and ammonia on iron and steel and its bearing on the process of cementation. ARTHUR BRAMLEY AND GEOFFREY TURNER. *Iron Steel Inst. Carnegie Scholarship Mem.* **17,** 23–66(1928); cf. *C. A.* **22,** 207.—Cementations of Armco Fe were made at various temps. with mixts. of CO and NH_3 and with mixts. of CO and H. In series A of the 4 sets of expts. the ratio of CO to NH_3 in the gases entering the reaction chamber was kept const., and the rate at which they were passed through the furnace was the same in all cases. The cementations were conducted at various temps. ranging from 700 to 1050° at intervals of 50°, and the process was continued in each case for 10 hrs. The ratio of CO to NH_3 in the gases delivered into the cementation chamber was varied in series B. Series C and D were arranged to correspond with series A and B, resp., but with the introduction of H instead of NH_3 into the CO. The test results prove that the carbonizing action of mixts. of CO and NH_3 is much greater than that of CO alone. The carburizing properties of mixts. of CO and H were stronger than CO alone, but not so intense as corresponding mixts. contg. NH_3. The micrographs show that the microstructure of the Fe-C alloys is entirely altered by the presence of N; especially is this the case when the cementations were made at temps. below 800°; above 800° very marked segregation of cementite takes place. **V. Determination of the iron/iron-nitride eutectoid. The action of ammonia on steels containing different concentrations of carbon.** ARTHUR BRAMLEY AND FREDERICK WARDLE HAYWOOD. *Ibid* 67–87.—A cylindrical bar of Armco iron was nitrogenized by heating it for sometime at a suitable temp. in an atm. of N and NH_3. A portion of the cemented bar was turned down on a lathe, the thin concentric layers of metal were ana-

lyzed, and a curve was plotted showing the relationship between the percentage of N present in the steel and the depth below the surface. A transverse section of another part of the bar was photographed and the prints were mounted together, so that a large composite micrograph was obtained. A millimeter scale was placed on the print along a line parallel to the edge representing the surface of the specimen, and at a known distance from it. With the aid of a magnifying glass, that portion of the line passing over the dark areas in the micrograph was measured. This was repeated along lines corresponding to depths increasing by 0.1 mm. below the surface of the specimen, so long as any dark particles were noticeable. If, along one of these lines, a strip of metal of infinitesimally small breadth and thickness be considered, that portion of this infinitely thin column of metal which is of eutectoid compn. will be known, and from the N concn.-depth curve previously mentioned the av. age percentage of N in this strip of metal can be ascertained. The Fe nitride-Fe eutectoid contains 2% of N; the eutectoid temp. has been deduced as 608° approx. A detn. of the Fe-FeC eutectoid and the soly. of C in α-ferrite, using the same method gave figures of 0.915% to 0.892% C for the eutectoid, and an av. value of 0.04% as the soly. of C in α-Fe. D. S.

Heat compression studies with pearlitic, martensitic and austenitic steels. HANS HENNECKE. *Sitzgb.* No. **94,** *Werketoff. Ver. deut. Eisen* No. **5,** 16 pp. (1926); *Physik. Ber.* **8,** 916(1927).—The results of static and dynamic investigations on 21 com. normalized steels lead to the conclusion that the larger increase in resistance to deformation of pearlitic steels at the α-γ transformation is due to the decrease in velocity of recrystn. above Ac_3. The tension distribution, deduced from measurement of grain size, agrees with calcns. from Mohr's law. Dynamic compression studies showed only for low-C steels a small elevation of deformation resistance at the α-γ transformation. Numerous other expts. are described. G. L. CLARK

Iron-chromium equilibrium diagram. P. OBERHOFFER AND H. ESSER. *Stahl u. Eisen* **47,** 2021–31(1927).—The equilibria in the system Fe–Cr have been detd. by thermal analysis and Röntgenographic investigation of a series of alloys made from electrolytic Fe and the purest Cr. The metals form a continuous series of solid solns with a min. m. at 1405° for the alloy with 14.5% Cr. The temp. of the A4 transformation decreases steadily with the addn. of Cr at the rate of 26° for every 1% Cr up to 14% Cr. The A3 temp. falls to a min. of 840° (heating) and 812° (cooling) with 8% Cr, then rises with further addn. of Cr, the curve finally meeting the A4 curve at 14% Cr; thus the field of γ-ion is limited to alloys contg less than 14% Cr. The temp of the A2 transformation rises to a max. of 771° with 2% Cr, then falls steadily in an almost straight line to 0° with 75% Cr. The heat evolved in the A3 and A4 transformations decreases rapidly with increase in the Cr content of the alloys.
B. C. A.

The inner structure of chromium steel. ED. MAURER AND H. NIENHAUS. *Stahl u. Eisen* **48,** 996–1005(1928).—A summary is given of the investigations undertaken to det. the constitutions of Cr carbides by means of residual analysis. A new evaluation of these investigations disclosed the fact that Cr_5C_2, Cr_4C_2 and Cr_6C_2 are the prevailing carbide compds. The carbide of Moissan and Arnold and Read (cf. *J. Iron Steel Inst* **83,** 256(1911)), Cr_4C, could not be obtained by any other investigator. Two series of expts. were carried out with 0.5%, and 1.0% C, resp., and increasing Cr content from 0.5 to 30% Cr. The specific elec. resistance of the samples was measured by the method of Ebeling-Lindeck after annealing and after quenching at 950° in linseed oil. The results were plotted against the Cr content. The curves so obtained are similar to those of Edwards and Norbury (cf. *C. A.* **14,** 2328) with a break at 5% Cr; while this indicates the formation of a carbide M. and N. do not think it possible to develop, from the measurements of the specific resistance, the formula of the carbide in question. The diagrams developed for the systems Fe–Cr and Fe–Cr–C are discussed and numerous references given. The intersection of the Ac_1 and Ac_2 lines was found by extrapolation at 2 and 2.5% Cr. The diagram of Murakami was found to be correct with the exception that the boundary line inclosing the alloys capable of transformation is not at 0 but at 17% Cr. The dilation-temp. and the magnetism-temp. curves failed to give any indication as to the compn. of the carbides or to the presence of double carbides. J. A. SZILARD

British and American automotive steels. J. W. URQUHART. *Blast Furnace & Steel Plant* **16,** 906–8(1928).—Steels used by Ford are compared with those used by European manufacturers of the same class of car. The outstanding difference is in the chem. specifications resulting in less difficult heat treatment on parts in the American practice. J. W. BOECK

Metals and alloys used for bearings. ANTONY SETON. *Metal Ind.* (London) **33,**

29–30(1928).—The proper selection of suitable bearing metals is pointed out. Cast iron, chill cast iron and bronzes are discussed. The compns. of some bearing alloys are tabulated. J. W. Boeck

Magnetic properties of perminvar. G. W. Elmen. *J. Franklin Inst.* **206,** 317–38 (1928).—Perminvar is the name chosen for alloys in the Fe-Co-Ni series which, when properly heat treated, are characterized by "const. permeability over a considerable range at the lower part of the magnetization curve, small hysteresis loss throughout the same range of flux densities, and by a hysteresis loop constricted at the origin for medium flux densities." One of these alloys with a compn. of Ni 45, Co 25 and Fe 30% has a permeability about twice that of Fe, const. within 1% for fields less than 1.7 gauss. For a max. flux density of approx. 600 gauss the hysteresis loop has no measurable area although the corresponding loops for Armco Fe and Si-steel give 33 and 14 ergs per cc. per cycle, resp. Even when carried to higher flux densities, so that a measurable loop is obtained, coercivity is absent. This holds up to a max. flux density of 5000 gauss. Only when carried to 15,000 gauss does the loop resemble those for ordinary magnetic materials. Heat treatment modifies the magnetic properties in marked degree. *E. g.*, the initial permeability for a specimen "air quenched" from 600° is more than twice what it is for an otherwise identical specimen which has been "baked" for some time at 425°, although this difference decreases with increasing fields and disappears for fields above 50 gauss. In general, the rate of cooling dets. the hysteresis loss and the shape of the hysteresis loops Expts. with a compound rod, consisting of an unannealed piano wire core in a permalloy tube, suggest that the constricted hysteresis loop of perminvar may be due to a segregation in the alloy. This raises interesting questions as to the nature of ferromagnetism. A large no. of interesting curves and considerable numerical data are given. W. W. Stifler

The effect of the addition of chromium on the electrical properties of iron-nickel alloys. P. Chevenard. *Stahl u. Eisen* **48,** 1045–9(1928); cf. *C. A.* **22,** 752, 1752.—The effect of the addn. of Cr on the elec properties of Ni and Ni-Cr alloys is similar to the effect of Cr on the other characteristics of these alloys. The conclusions obtained previously by C. (cf. *C. A* **20,** 2813) and Ribbeck (cf. *C. A.* **21,** 557, 1085, 1958) are confirmed Cr extends the field of the austenitic Ni-Fe alloys toward the Fe field and reduces considerably the anomaly connected with the magnetic transformation, but causes a new anomaly "X" in the paramagnetic state. J. A. Szilard

Work performance and bending strength of high-speed steels. W. Oertel. *Stahl u. Eisen* **47,** 2036–8(1927).—The addn. of Co to high-speed tool steels contg. 0.7% C, 4.2–4.5% Cr, 17.0–18.4% W, and 1.3–1.9% V increases the cutting power very considerably, the best results being obtained with a high V content. Equally good results are obtained with W steels contg 2.9% Co and 1.9% V as with similar steels with 5.5% Co and 1.7% V. The max hardness combined with good elastic properties is produced by hardening at 1100–1200°. The bending strength of the steels hardened at 1025° falls to a very low value after tempering at 200°, rises somewhat at 300°, falls again at 400°, then rises rapidly with increase of tempering temp. to 600–625°, within which range the max. elasticity is obtained. B. C. A.

Principles governing the choice and utilization of permanent-magnet steels. R. L. Sanford. U. S. Bur. Standards, *Sci. Paper* **22,** 557–67(1927).—Magnet steels with a high Co content have coercive force values 2–5 times as great as those of the Cr or W steels generally used in the manuf. of permanent magnets, and the residual induction is only very slightly lower, but Co steels cannot be satisfactorily substituted for Cr or W steels without changing the design of the magnet. From tests of numerous types of magnet steels it is shown that the product of the coercive force and the residual induction is the best criterion of the value of a steel for this purpose. Magnet steels can be stabilized against permanent deterioration from transient demagnetizing fields by subjecting them to partial demagnetization; this method is particularly applicable to the treatment of Co steels because of their high coercive force. B. C. A.

Cast permanent magnets. J. Ferdinand Kayser. *Metallurgist* (Suppl. to *Engineer* **146,** No. 13) 136–8(1928).—Co-Cr magnets contain 10% Cr and 6 to 15% Co The relationship between coercive force and Co content is expressed by the formula $H_c = h + K_2Co$, where h is the coercive force of the Co-free base, Co the % of Co present and H_c the coercive force of the alloy. K_2 is approx. 7.5. In Co-Cr magnets made from rolled bars the same formula applies but K_2 = 5.5. Various types of such magnets are illustrated. D. B. Dill

Estimation of zinc pickup in hot galvanizing. E. D. Timmerman. Steel Co. of Can., Montreal. *Can. Chem. & Met.* **12,** 249–50(1928).—The application of the formula, $I = ak/m$, to estn. of the Zn pickup for washers, screws and square blank nuts

is illustrated. I = the percentage increase in wt. of the object after galvanizing; a = the surface area of the object in inches; m = the wt. of the object in lbs. after pickling and k = a const. for a given pickling plant. k is detd. for each pickling machine in the plant by exptl. detn., the objects being weighed before and after pickling and the surface area calcd. The value of k is variable between rather wide limits but in the shop the application of the formula affords a method of accounting and cost estn.

J. W. SHIPLEY

Obtaining a satisfactory zinc coating. WALLACE G. IMHOFF. *Iron Age* **122,** 811–4 (1928).—Factors affecting the quality of Zn for hot galvanizing and effects of Fe and Pb are noted. When no metallic addns. are made to the bath, the surface quickly oxidizes after a few days' operation. Spangles may be obtained, for a short time, with no metallic addns., but from a practical standpoint, pure Zn will not give a spangle due to rapid contamination with small amounts of Fe and rapid surface oxidation with resultant powdered luster. Pb is not harmful because it alloys with Zn only in small amounts and any excess Pb not alloying with Zn settles to the bottom of the pot. Cd tends to produce fine spangles, Al to give the coating a bright appearance and keeps down excessive oxidation of the Zn, Sn develops the large spangles on sheets and Sb, entering through the charging of scrap metal, tends to cause a brittle coating and a yellow discoloration if in too large amounts. Photomicrographs show the surfaces of high-Fe commercial slab Zn, of very pure commercial slab Zn and of pure rolled sheet Zn with total impurities less than 0.1%. W. H. BOYNTON

Notes on the hot tin-plating of wrought iron articles. EMILE BERTRAND. *Arts et métiers* No. **96,** 343–7(Sept., 1928).—Descriptive. A. PAPINEAU-COUTURE

A new process for spraying aluminum. F. A. LIVERMORE. *Metall* **48,** 89–91; *Chem. Zentr.* **1927,** II, 736.—Plant experiences of the firm Ludwig Löwe, Berlin, with the spray molding process are described. The description covers the compn. of the alloys, the properties required of the alloys, plant practice, and hints to the manufacturer of the castings. J. S. REICHERT

A new method of homogeneous lead coating. E. WASER. *Chem.-Ztg.* **52,** 719–21 (1928).—CO_2 under pressure at 350–400° is used in the Schoop spraying pistol to apply the Pb out of contact with O. J. H. MOORE

Alloy materials for boiler shells and tubes. J. B. ROMER AND W. W. EATON. *Power* **68,** 195–7(1928).—Locomotive tube sheets, side sheets and crown sheets are now commonly made from a Cu-Mo-Fe alloy called "Toncan" contg. 0.4% Cu and 0.05% Mo. This alloy resists corrosion and is similar to the best grade of low-C steel in phys. properties. Cr-Ni-Fe alloys resist corrosion and also retain their strength at high temp. A type analysis is C < 0.2%; Mn < 0.5%; P < 0.03%; S < 0.03%; Si < 0.5%; Cr 17–20% and Ni 7–10%. A typical alloy, *Enduro* 18–8, has the following phys. properties, hot rolled and annealed, resp.: *tensile strength,* 110,000, 90,000 lb per sq. in.; *yield point,* 82,000, 35,000 lb. per sq. in.; *proportional limit,* 67,500, 30,000 lb. per sq. in.; *elongation* in 2 in., 36, 61%; *reduction in area,* 52, 75%; *Brinell hardness,* 223, 135; *Rockwell hardness,* B-95, B-85. D. B. DILL

Value of aluminum and its alloys in chemical and allied industries. H. BUSCHLINGER. *Chem. Fabr.* **1928,** 209–11.—The corrosion of Al, as of other metals, is affected by cryst. structure and surface quality, the absence of inclusions (*e. g.,* Al_3Fe), and particularly by the quality of the water used if aq. solns. are being handled. The possibility of the application of Al to plant use in tar distn. is discussed. The penetration of the protective surface layer of oxide is often the decisive factor in starting corrosion. Large Al vessels should on structural grounds be cylindrical rather than hemispherical. The rapid diminution in strength with rise of temp. is pointed out. While the walls of vessels to withstand pressure are constructed on a theoretical basis the minor parts are usually designed according to empirical rules. In jacketed vessels the steam inlet must be designed to minimize mech. wear. In all cases corners and angles should be avoided to facilitate cleaning. With Al vessels which are to contain edible prepns., rollers, etc., should be used exclusively for Al, and the sheets should be pressed so as to give a smooth surface capable of polishing both inside and out. Suitable packing material, quite free from acid, should be used. B. C. A.

Mechanical properties of aluminum casting alloys at elevated temperatures. R. L. TEMPLIN, C. BRAGLIO AND K. MARSH. *Metal Ind.* (London) **33,** 179–82, 204–6(1928).—An abstract dealing with investigations carried out to ascertain the tensile strength of some Al casting alloys, and pure Al exposed at high temps. for short periods. The tensile properties at temp. ranges of 24–427° were emphasized with a few detns. outside of this range. Pure Al and low-Cu Al alloys show an appreciable effect of temp. on their mech. properties beginning at or near room temp. Alloys with higher Cu

content show little effect until temps. of 200–260° are reached. The alloys not following the general trend of the other groups in their behavior at the various temps. include essentially those that are susceptible to artificial aging or secondary heat treatment. When the tests of such alloys are made at or near the temps. corresponding to their aging temps. marked differences are observed in the test results. The "kinks" in the tensile-strength and yield-point curves for these alloys are almost eliminated by artificial aging of the specimens, at suitable temps., subsequent to the initial heat treatment. Multiplying the routine tensile strength figure at room temp. by 0.8 gives a value that introduces no serious discrepancies and may be considered in detg. the suitability of the various alloys for use at temps. between 24° and 427°. W. H. B.

Heat treatment of duralumin. Leslie Aitchison. *Fuels and Furnaces* **6**, 1191–4 (1928).—The heat treatment of duralumin necessary to produce the max. stress value is described. "As cast" duralumin possesses few mech. properties better than the binary alloys of Al. Quenched from a temp. of about 480° and aged for 5 days, duralumin possesses a max. stress of about 50,000 lb. per sq. in. Large castings should be machined before heat treatment as the quenching process is not so effective towards the center of a large casting. The desirable mech. properties diminish from the outside to the center of the metal. Age-hardening produces differential vol. changes in large castings tending to warp the metal. In small castings there is not sufficient difference in the rate of aging of the exterior and interior to cause warping. Castings should be machined as nearly as possible to finished sizes, before heat treatment, so as to reduce the ruling thickness of the metal to the min. J. W. Shipley

The causes of aging of the duralumin alloys. P. Ya. Saldau. *Ann. inst. anal. phys. chim.* (Leningrad) **3**, No. 2, 842–60(1927).—A review. G. B. Kistiakowsky

Observations on casting aluminum and its alloys. W. J. Clark. *Foundry* **55**, 847–9(1927).—A general discussion, with emphasis on cores, gates and pouring precautions. The higher shrinkage, the tendency to draw, crack and break on cooling, and frothing and drossing tendencies are noted. W. H. Boynton

Heat treatment of aluminum and its light alloys. VI. Discussion of defects of aluminum alloys due to heat treatment. Robert J. Anderson. *Fuels and Furnaces* **6**, 1035–6(1928); cf. *C. A.* **22**, 2912.—Improper procedure in quenching Al alloys may result in cracks, distortion, incipient melting, blistering and quenching stresses. Undue bumping or jarring during the transference of the pieces of metal, and too rapid cooling on quenching, must be avoided to prevent cracking or distortion. Heat treatment of alloys produces enhanced mech. properties. Al has a hardness of 15, while heat-treated Al alloys have a hardness above 150. The tensile strength of Al is about 12,000 lb per sq. in., while that of wrought Al alloys ranges from 34,000 to 80,000. J. W. Shipley

Aluminum brasses. Edmund R. Thews. *Can. Chem. Met.* **12**, 246–8(1928).—T. describes the heat treatment of Al brasses and reviews the metallurgical influence of the element as regards the casting properties of brasses. Al in brasses assists in fluxing the impurities and prevents drossing and fuming while conferring a high degree of fluidity on the melt. Up to 8% Al the tensile strength and elasticity of brasses increases but because of other deleterious properties imparted to the brass, percentages above 2 are undesirable. Up to 0.5% Al brass alloys can only be cold-rolled; at 1% the rolling and forging should not be above 140° F., while at 2% Al the brass may be rolled at dark red heat. Brasses contg. 33% Zn can only be hot-rolled when the Al content lies between 2.5 and 3.5%, while 60/40 brasses may be hot-rolled irrespective of their Al content. Quenching Al brasses produces brittleness. The order of alloying the constituents of Al brasses affects the mech. properties. Alloying the Cu and Al and then adding the Zn produces a "hard" metal. Al acts as an excellent deoxidizing agent and adds heat to the melt by reason of its higher heat of combustion. To prevent the inclusion of Al_2O_3 in the brass, pouring should be from the bottom of the melt. Al brasses are more resistant to corrosion than common brasses and are particularly useful to the ship-building industries. Iron in Al brasses imparts resistance to wear without affecting its strength and ductility. Tables relating the compn. of Al brasses to mech. properties are given. J. W. Shipley

The porosity and the physical properties of red brass. Reitmeister. *Warme* **50**, 526–30, 539–42; *Chem. Zentr.* **1927**, II, 1509.—There are 2 kinds of porosity, a so-called "outer porosity" which is characterized by the presence of large holes in the surface of the brass and another which is characterized by presence of small pores which are hardly or not at all visible to the naked eye (spongy porosity). This work deals with the inner porosity which arises from sepn. occurring when the alloy solidifies. The means of eliminating the spongy porosity and liquation are: the elimination of differ-

ences in temp. in the cooling brass, the shortening of the time of solidification of the alloy, and rapid cooling. The relation between chem. compn., liquation tendency and phys. properties of red brass and methods of testing are described. J. S. REICHERT

Recrystallization of α-brass with hot deformation. A. WITTNEBEN. *Z. Metallkunde* **20,** 316–22(1928).—The course of recrystn. in α-brass is studied by a systematic detn. of grain size, the alloys investigated are designated as Ms 90, Ms 85, Ms 73 and Ms 68; they contain approx. 90, 85, 73 and 68% Cu. They are subjected to a varying degree of deformation at 500°, 550°, 700° and 850°. The course of recrystn. is in general found to be the same as with soft Fe and Cu. Curves are plotted showing the relation of grain size to % deformation for the temps. used. Up to a definite degree of deformation, the grain size is unaffected, but above this point, a sudden change occurs due to recrystn. At higher temps. the grain size is apt to be larger than the original, while at lower temps. it is generally smaller. With a given alloy, recrystn. does not occur below a certain temp., regardless of the degree of deformation. This lower limit of temp. is 265° for Ms 90, 295° for Ms 85, 320° for Ms 73 and 330° for Ms 68. The original grain size has no influence upon grain size after recrystn., even with a difference in initial grain size of 2000%. The variation of recrystn. velocity with temp. is discussed. H. STOERTZ

The copper-magnesium alloys. III. W. R. D. JONES. Univ. College, Cardiff, Wales. *J. Inst Metals* **1928** (advance copy), No. 469, 11 pp.; cf. *C. A.* **21,** 3880.—Cu-Mg alloys contg. up to 10% Cu were forged and heat-treated, and tested for impact resistance at various temps. with a Charpy machine. With over 7% Cu the results at room temp. were variable, and the fractures were of a brittle type. Addns. of Cu up to 2% raised the impact value to 14 ft.-lb.; lower values were obtained with over 2% Cu in the forged alloys, and with over 5% Cu after heat-treatment. When kept 20 days at −7° and tested at that temp., the impact values of the tougher alloys were decreased, while those of the more brittle alloys were the same as at room temp. When tested at higher temps. up to 300°, the embrittling effect of Cu up to 8% was much decreased; with about 2% Cu impact values around 20 ft.-lb. were obtained at 200° to 300°. The forging temp. should be above 350°. The microstructures are illustrated and described. Forging broke up the Mg_2Cu network and caused the globules to be arranged in streaks. Quenching or air-cooling from about 460° increased the globule size, but did not improve the impact values GEO F. COMSTOCK

X-ray diffraction studies of copper alloys. JOSEPH LOISEAU. *Compt. rend.* **186,** 1732–3(1928).—After rolling and annealing, the Laue diagrams of pure Cu sheet and of 3 brasses: (1) Cu 67%, Zn 33%; (2) Cu 60%, Zn 40% (without Pb); and (3) Cu 60%, Zn 40% (with Pb) have been studied with the object of discovering the mechanism of recrystn. Annealing has the effect of orienting the (100) planes around an axis normal to the plane of the sheet. Overheating brings about reflections from the (110) (111) and (200) planes which are not evident under proper annealing conditions. A. J. KING

The influence of the addition of nickel to some copper alloys. HENGSTENBERG. *Metallborse* **17,** 1965–6, 2021–2, 2077–9; *Chem. Zentr.* **1927,** II, 2225.—Old and recent works of various investigators are cited to show the favorable influence exercised by a low percentage of Ni in Cu and Cu alloys. C. C. DAVIS

Mechanical properties of brass crystals. M. MASIMA AND G. SACHS. *Z. Physik* **50,** 161–86(1928).—A study was made of the behavior of small brass rods (73/27%) consisting of single crystals, over 80 mm. long. The observed phenomena are more complicated than those found in pure metals. The elec. conductance was within 1.5% the same in all directions but the measurement of the elastic properties (tension and torsion) showed that the rods were strongly anisotropic. The sp. extension α for a crystal the axis of which coincided with the cube-axis of a face-centered lattice was 3.5 times the value of α for a crystal oriented in the direction of the diagonal of a cube. The sp. torsion for these 2 extreme positions was in the ratio of 1:3. When the rods are stressed slip takes place, first on planes most favored with regard to the direction of applied stress until the orientation changes to a point where another system of slip planes becomes predominant. In highly symmetric orientations slip occurs in different parts of the rods along different slip planes. The beginning of slip occurs independent of the orientation at a tension of 1.44 ± 0.07 kg./sq. mm., in most cases without any hardening effect. Further deformation causes pronounced hardening. Slip in another direction becomes noticeable in the curves of tension *vs.* reduction in area by a sudden change of direction. The formation of the constrictions and fractures could not be satisfactorily explained. It was noticed, however, that the slip planes were strongly bent in the neighborhood of the fracture. H. S. v. K.

Heat treatment of drop-forged brass. R. Hinzmann. *Fuels and Furnaces* **6,** 1047–50, 1069–70(1928); cf. *C. A.* **21,** 3592.—In making drop forgings from brass bars some had perfectly smooth surfaces, while others made from the same bar had rough surfaces, showing cracks at the edges. An investigation was carried out to discover the cause of these differences. The variation in grain structure along the bar was found to be due to temp. differences during extension. The front end consists largely of needle-shaped α and β brass crystals while the rear end of the bar stretched at a lower temp. contains globular α and β grains. Annealing the bar did not give a uniform grain structure unless the temp. was kept above the crit. temp. of transformation, when on slow cooling the desired network of needle-shaped α crystals was obtained. Bars of different sizes subjected to the same annealing conditions gave brasses of different physical properties, due to varying grain formations within the metal. Annealing of globular α and β brass frequently results in a very coarse-grained metal. J. W. S.

The gold-platinum alloys. A. T. Grigor'ev. *Ann. Inst. platine* (Leningrad) **1928,** No. 6, 184–94.—G. has investigated the binary mixt. Au-Pt by means of thermal analysis, by studies of the microstructure and by measuring the hardness of the tempered alloys. He finds by all 3 methods that 2 solid solns. can be formed in the system: of Au in Pt with the limit of 20% by wt. of Au and of Pt in Au with max. 25% Pt. In the medium range of compn. a mech. mixt. of the 2 solid solns. is crystd. on cooling. The hardness was detd. according to Brinell (*Dinglers polytech. J.* **320,** 280(1905)). The hardness compn curve rises non-linearly up to 25% Pt, follows a linear section until 80% Pt, with a max. of 128.8 Brinell units at this last compn. and finally the curve drops again to the value of pure Pt of 26.0 units. G. B. Kistiakowsky

The constitution of the iron-tungsten and the iron-molybdenum alloys. Harry Arnfelt. *Iron Steel Inst. Carnegie Scholarship Mem.* **17,** 1–21(1928).—The binary Fe–W and Fe–Mo systems have been studied by means of x-ray analysis and it is shown that the equil. diagrams of these alloys hitherto suggested must be modified. A. concludes from his study of the Fe–W system that there are at least 2 intermediate phases present in this system, one of them having a hexagonal structure with a chem. compn. corresponding to the formula Fe_2W Another intermediate Fe-W phase has a trigonal lattice and crystals of this phase have been isolated and found to have a compn. corresponding to Fe_3W_2. In the Fe–Mo system there is an intermediate phase present that is analogous to the trigonal Fe-W phase. Crystals of this phase have a compn. corresponding to the formula Fe_3Mo_2. There seems to be no phase present in this system which corresponds to the hexagonal phase in the Fe-W alloys, but at a higher Mo content a new phase appears in the microstructure, which solidifies primarily. Possibly, if not probably, a third intermediate phase occurs in alloys comparatively low in Mo. Downs Schaaf

Lead-antimony alloys. W. Broniewski and L. Sliwowski. *Rev. métal.* **25,** 397–404(1928).—After reviewing previous work on Pb-Sb alloys, B. and S. give in tabular and graphical forms the results of numerous detns. of elec. cond., thermoelec. power, soln. potential, hardness, expansion coeff., m. p., solifying pt. and also results of micrographic examns. They conclude that these alloys are formed of 2 limiting solid solns. and their mixts., and that the anomalies observed both in earlier work and in the present measurements may be due either to imperfections in the methods used or to a change in the cryst. orientation of Sb. A. Papineau-Couture

X-ray analysis of the thallium-antimony alloys. Elis Persson and Arne Westgren. Univ. Stockholm *Z. physik. Chem.* **136,** 208–14(1928); cf. *C. A.* **22,** 3874.—Alloys of Tl and Sb ranging from 0 to 100% Sb were prepd. from pure metals. Powder x-ray pictures were taken with Fe-K radiation showing the existence of four phases: (1) α-Tl which, in the pure state, has a hexagonal close-packed lattice with the edge of the prism base equal to 3.449 A. U. and the height of the prism 5.513 A. U. (2) A phase with about 7% Sb, apparently a solid soln. of Sb in β-Tl, which has a face-centered cubic lattice with the parameter 4.842 A. U. (3) A second intermediate phase, corresponding to the compn. Tl_7Sb_2, which has a complicated cubic lattice. The parameter is given as 11.59 A. U. and the elementary cube contains 54 atoms. (4) Pure Sb, which has a face-centered rhombohedral lattice, the edge being 6.226 A. U. and the angle 87°24′. A. W. Kenney

A study of tin-base bearing metals. O. W. Ellis and G. B. Karelitz. *Metal Ind.* (London) **33,** 132–4, 156–8(1928).—A compilation of results of metallographic and mech. tests on a series of Sn-Sb-Cu alloys contg. up to 10% Sb and 8% Cu. Relationships between compn., microstructure, hardness and compressive strength of these alloys are given and the influences of elevated temps. and of Pb upon these properties are indicated. Two series of 25 alloys each were cast under varying conditions.

High-Cu alloys caused some trouble in pouring and the metal remaining in the crucible showed many large crystals of CuSn and a paucity of the Sn-rich matrix, while the portion flowing from the crucible contained few coarse crystals of CuSn and possessed an almost normal proportion of solid soln. Photomicrographs have indicated that the substitution of Pb for Sn in low-Cu alloys causes CuSn needles to crystallize in massive form, and the deleterious effect of Pb on malleability and shock-resisting qualities of certain of these alloys is due to the manner in which CuSn crystals sep. from the melt. A definite relation exists between the Brinell hardness numbers and the compressive strengths. High Cu content is undesirable with working temps. above 75°. The strength of these alloys falls appreciably with increased temp. within the working range of babbitts in bearings. Pb increases the mech. strength of babbitts, when used up to but 1%. At higher concns. the effect is entirely lost. The microstructural changes occasioned by Pb confirm the current opinion regarding its embrittling effect.
W. H. Boynton

Laboratory experiments on high-temperature resistance alloys. C. J. Smithells, S. V. Williams and J. W. Avery. Gen. Elec. Co., Ltd., Wembley, England. *J. Inst. Metals* **1928** (advance copy), 466, 22 pp.—Previous investigations of the Cr-Ni alloys are reviewed briefly. Alloys contg. 10 to 60% Cr, 40 to 90% Ni and 0 to 20% W or Mo were prepd. by fusing bars pressed from the mixed powd. metals and sintered together. Specially purified H was used to reduce Ni from the carbonate and a more pure electrolytic Ni was also used. Electrolytic Cr was treated with H to reduce oxides, and the melting was done in H. The alloys were cold-rolled and drawn to a diam. of 0.375 mm., with periodical annealing in H. With Cr up to 40%, cold working was easy; the alloy with 50% Cr could barely be drawn, and that with 60% Cr was glass-hard. The alloy contg. 40% Cr consisted of a solid soln., but with more Cr and less Ni a harder constituent appeared. With 20% Mo and low Cr a second phase also was found. A few photomicrographs of typical structures are shown. Methods of estg. the resistance to oxidation are discussed, and the method relied on was a life test of a 1-in. coil heated to 1100° by the passage of an elec. current. Alloys made with electrolytic Ni gave better results than those contg. more impurities. Intermittent heating gave much shorter life than continuous heating. Alloys contg. 70% Ni, at least 20% Cr and either with or without 10% W or Mo, gave the best results. The resistance to sag at high temp. decreased as the Cr or other alloy contents increased. Alloys with a duplex structure showed excessive sagging. By microscopic examn and x-ray analysis two types of oxides were recognized, protective contg. over 50% Cr_2O_3, and nonprotective with less Cr_2O_3. The lower Cr alloys showed chiefly the latter type. The elec. resistivities were measured at temps. up to 1000°, the app. used being illustrated and described, and the results plotted as curves. The latter show a max. or an inflection between 500° and 550°. The resistivities increased as the Ni content decreased; when W replaced part of the Cr, the resistivity decreased, but Mo had the opposite effect.
Geo. F. Comstock

Diseases of metals in museums. N. N. Kurnakov. *Ann. Inst. anal. phys.-chim.* (Leningrad) 3, 750–9; *Chem. Zentr.* **1927**, II, 2706.—Antique patina protects bronzes from further deterioration, whereas "wild" patina, which consists essentially of $3CuO.CuCl_2.4H_2O$, accelerates it. To remove the latter without injuring the former, the diseased bronze object may be boiled with Mg and water, whereby the following reaction occurs: $3CuO.CuCl_2.4H_2O + 3H_2 \longrightarrow 3Cu + CuCl_2 + 7H_2O$. A light coating of "wild" patina is removed by applying wadding impregnated with an alkali, heating gently (not over 300°) and drying.
C. C. Davis

Attack of iron and steels by the more important of the common acids. M. Sauvageot and (Miss) L. Lauprète. Schneider & Cie. *Chimie & industrie* Special No., 362–74(April, 1928).—Results are given in detail (in both tabular and graphic form) of corrosion tests carried out on a semi-hard steel (C 0.26, Si 0.41, S 0.043, P 0.059, Mn 0.54%) with H_2SO_4, HCl and HNO_3 at 15° and 45°, and in some cases at 0° and 80° also. A no. of tests were also made on an extra-mild steel (C 0.090%), a mild steel (C 0.083%) contg. 2.38% Ni, a mild steel (C 0.080%) contg. 0.642% Si, a mild steel (C 0.070) contg. 3.10% Si and a 12% Mn steel (C 1.14%). Conclusions: The rate of attack in H_2SO_4 increases with the concn. to a max. (corresponding to a concn. which is lower at high than at low temps.), then decreases rapidly and becomes very small at high concns. Gray cast Fe behaves like steel, but the concn. of max. corrodibility is lower than in steel. With HCl, the attack increases regularly with the concn. in both cast Fe and steel. With HNO_3 there is a range of low concns. in which the rate of attack of both cast Fe and steel increases with the concn., the range being approx. the same in both cases; but above this range the be-

havior of the 2 classes of metals is different. In steels for temps. below about 25° there is a zone in which the attack is variable, with irregular appearance of passivity, and which precedes the zone of true passivity; at higher temps. there is a zone of extremely violent attack, which reaches a max. and then falls rapidly to the zone of complete passivity. In gray cast Fe, max. attack occurs at a lower concn. than with steel and is followed at all temps. by a zone in which corrosion decreases progressively owing to the regular and increasingly rapid appearance of passivity, until the range of concns. of immediate passivity is reached. The above conclusions should not be generalized for all steels and cast irons, but S. and L. consider that on the whole they are applicable to the majority of annealed structural steels and for gray cast irons. A. P.-C.

The corrosive effect of water and its deacidification. Hermann Manz. *Wärme* **50,** 401–4, 416–9; *Chem. Zentr.* **1927,** II, 1382.—In continuation of his 1st article (*Ibid* **50,** 384–8(1927)), M. points out the important fact in practice that the excess-CO_2 ("corrosive CO_2"), estd. by analysis, is unimportant, if its quantity does not exceed 3.3% of the bicarbonate-CO_2 or 11% of the free CO_2. G. Schwoch

The phenomena of corrosion of iron and steel. A. Herrero and M. de Zubiria. *J. Iron Steel Inst.* (advance copy), No. **3,** 16 pp.(Sept., 1928).—Both the electrolytic and chem. theory of the corrosion of metals are discussed as well as some electrochem. phenomena. The causes producing corrosion are of 2 types: first, those which are independent of the object which suffers corrosion, and second, those which are a function of the phys. and chem. properties of the object. In the first classification are included: (1) atm. conditions in general, (2) degree of contamination of the air or water by gases, such as CO_2 which is very easily dissocd., or SO_2 gas which has a very intensive corrosive action, (3) stray currents from elec. circuits of high potential, (4) contact with other metals or with ferrous metals of different chem. compn., (5) faulty design. In the second group the following causes are mentioned: (1) local differences of compn. due to non-metallic inclusions, (2) deposits, local or otherwise, of foreign bodies, (3) segregation of metalloids, (4) internal stresses or strains. Also in *Foundry Trade J.* **39,** 239–40, 265–6(1928). D. S.

The resistivity of iron-copper alloys to acids and corrosion. S. S. Steinberg. Ann. inst. polytech. *Oural* **6,** 73–82(1927).—A comparative study has been made of the effects of H_2SO_4, HCl and HNO_3 and of the exposure to air on Fe-Cu alloys contg. from 0.13 to 1.21% Cu (0.10–0.14% C, 0.28–0.65% Mn, 0.021–0.060% P) and on ordinary sheet Fe (0.5% Mn, 0.07% C, 0.1% P, 0.012% Cu). H_2SO_4 (10 and 20% solns.) dissolves the alloys about $^1/_{10}$ as rapidly as it does the Fe. The action of HCl is about $^1/_2$ as rapid on the alloys. HNO_3 acts equally fast on both. Expts. on the rate of corrosion in air, although yielding somewhat erratic results, still indicate that the alloys show a greater resistance to corrosion than does the sheet Fe studied. The protective action of Cu is due to preferential soln. of Fe from the surface layer of the alloys, whereby the concn. of Cu in the surface is greatly increased. Thus, the expts. show that the full protective action of Cu is obtained only after about 24 hrs.' exposure to acids and that by mech. removal of this new surface the resistivity to acids can be decreased. G. B. Kistiakowsky

Material for grate bars. R. Stumper. *Arch. Wärmewirt* **8,** 335–6(1927).—S is not very injurious in grate bars, as they take it up in any case from the fuel. Photographs are given to show that oxidation takes place first at the boundaries of the graphite grains; hence a close structure is desirable. Ernest W. Thiele

Influence of copper on corrosion-resistance of steel and cast iron. R. T. Rolfe. W. H. Allen, Sons and Company, Bedford, England. *Iron and Steel Ind. and Brit. Foundryman* **1,** 205–8(1928).—A review. J. K. Roberts

Corrosion and the crystallite arrangement of rolled plate. R. Glauner and R. Glocker. *Z. Metallkunde* **20,** 144–7(1928).—Hot- and cold-rolled Cu plates were subjected to the action of HCl, HBr, H_2SO_4, CH_3COOH and mixts. of these with H_2O_2; also HNO_3, $HClO_4$, NH_3 and $(NH_4)_2S_2O_8$. The pieces were corroded in a rotating tester at const. velocity and temp. and examd. micro- and macroscopically. The influence of crystal orientation differed for different electrolytes. In some solns. the attack was more marked when there was no regular orientation and in others *vice versâ*. Both chem. and optical examns. must be made to det. the influence of crystallite arrangement on the corrodibility of metals. B. E. Roetheli

The protective action of sodium sulfate on the attack of ingot iron by alkalies and salts under high pressure. E. Berl and F. von Taack. Tech. Hochschule, Darmstadt. *Arch. Wärmewirt* **9,** 165–9(1928).—Tests 7.5 hrs. long were made on powd. ingot Fe in a bomb at 260–360°. After the test, alky. of the soln., loss of Fe and gain in O of the powder, and H_2 formed were detd. Up to about 0.02 *N* concn., NaOH

decreases the corrosion of pure water; above this the corrosion rises rapidly. When Na_2SO_4 is added in any amt. from 0.01 to 0.9 mol. per l., the corrosion for any concn. of NaOH remains below that for pure water. NaCl is weakly corrosive, and does not affect the action of NaOH. $NaNO_3$ evolves NO instead of H_2, and is moderately corrosive but inhibits NaOH to some extent; Na_2HPO_4 is more corrosive and a better inhibitor. Na_2S is very corrosive. Rontgen spectra show that the only oxides formed are FeO and Fe_3O_4. The effect of sulfate is perhaps due to the formation of a firm oxide film. ERNEST W. THIELE

Corroding action of solutions of various chlorides on cast iron and lead. B. K. PERSHKE AND G. I. CHUFAROV. Ural Polytech. Inst. *J. Chem. Ind.* (Moscow) **5**, 523–8(1928).—To det. the influence of the compn. of cast iron, 4 kinds were cut into plates and exactly weighed before and after their immersion in the salt solns. Of these 4 samples 1 was made by melting Fe with coke, whereas the other 3 were manufd from Fe and charcoal. The samples contained 0.0, 0.3, 0.41 and 0.89% Cr, resp. The aq. salt solns. used were those of KCl, $MgCl_2$ and NaCl, satd. and dil., pure and mixed. The detns. of the extent of corrosion were made while the following conditions were varied: access of light, satn. of the soln. by air, stirring of the solns., periodical removal of accumulated rust, etc. *NaCl solns.* have the max. corroding effect; *$MgCl_2$* has the minimum action; *KCl* is intermediate. It follows that sylvite solns. affect cast iron less than carnallite solns. Dil. solns. are generally more corrosive than satd. solns., the max. of corrosion having been attained with solns. of about 1% strength. Stirring of the solns. and their saturation with air treble the extent of the attack. Periodical drying of the samples increases the action of the solns. 1.25 times, whereas light increases it 1.7 times. The rate of corrosion remains unchanged with time. Cast iron is affected to the depth of 0.5 mm. annually under the most unfavorable conditions of action of the solns. The value of various *protective paints* was examd. A tar coating reduced cast iron corrosion to 1/5. *Lead* is attacked by solns. of chlorides 1/9 as much as cast iron, losing a layer of about 0.0065 mm annually. BERNARD NELSON

Lead as a protective coating for industrial chemical apparatus. A. JULIÁ SAURÍ. *Quim. Ind.* **5**, 117–21(1928).—A brief review of the resistance of Pb to chemicals and the 4 industrial processes of Pb plating: Schoop spraying, autogenous welding, direct deposition and electrodeposition. MARY JACOBSEN

Lead as a constructional material for chemical plant. S. J. TUNGAY. *Chem. Age* (London) **19**, 27–30(1928).—Among the valuable properties of Pb are: softness, plasticity, ductility, easily fused, cold worked by hammering, easily obtained pure, abundant and acid-resisting. Pb is serviceable for few acids other than H_2SO_4. It is perfectly resistant to cold dil. H_2SO_4 though it corrodes with 80% H_2SO_4, particularly when hot. Pb does not stand up to oleum or fuming H_2SO_4. "Chemical lead" is 99.99% pure. Five analyses of high-grade Pb are given of the quality over 99.67%. The purer the Pb the greater is the resistance to H_2SO_4. Cu sometimes nullifies the effect of Sb. Pb may contain inclusions of oxide which will produce porosity. Pb over 99.99% is best and an analysis is given of a Pb over 99.986% pure. Causes of failure seem obscure: repeated creeping and stretching nullify the protective coating on Pb which may then easily fail. The thickness of the protective corroded film depends on the velocity of flow of the corrosive material. Surface strains lead to corrosion. Concn. of liquid and the temp. affect corrosion. The presence of a salt of the metal in the corrosive liquid generally aids corrosion. NaCl in H_2SO_4 accelerates corrosion. Pb is used in phosphate, sulfonation and chlorination, $(NH_4)_2SO_4$ and nitroglycerin plants and in handling mixed acid. Vessels may be lined with Pb; a homogeneous lining is best. Hard Pb alloys are used for vessels, pans, frames, acid pumps, fans for acid gases, taps, ejectors and for plugs. Regulus metal must be made of Pb 99.9% pure and of Sb 99.5% pure; otherwise the castings may not be reliable. This alloy may contain 6–8%, 8–10% or 10–12% Sb. S. L. B. ETHERTON

The scope of corrosion-resisting steels in chemical engineering. T. H. BURNHAM. *Ind. Chemist* **4**, 320–4(1928).—The slowness with which the new corrosion-resisting steels are being introduced into chem. plant is due principally to the complexity of the problems of corrosion. The alloy steels discussed range from 10 to 30% Cr and 7 to 40% Ni, with an Fe content of from 50 to 70%. The most useful are found in two sep. ranges, one contg. 18–25% Cr with 7–10% Ni, the other contg. 10–15% Cr with 30–40% Ni. Other elements such as Si, Cu, W or Mo may also be present. The physical and mechanical properties of "Era C. R." steel are given, also the proper heat treatment and method of descaling. All these steels can be readily machined and welded. "Era C. R. 3" is not appreciably attacked by dil. H_2SO_4. All will resist corrosion by fermentation products including AcOH. The Ni-Cr steels are resistant

to HNO_3 and to HNO_3 + H_2SO_4. Several grades are suitable for milk cans. Steels may also be obtained which are resistant to dil. H_3PO_4, boiling fruit juices, to most of the solns. in the manuf. of artificial silk, to dye-house liquors, to the liquors encountered in refining fats and oils, to $FeSO_4$ soln, to filter alum, to NH_3 and to various salts. "Era H. R." can be used for NaOH fusion and molten $NaNO_3$ up to 700°, for high-pressure work (*e. g.*, Bergius hydrogenation of coal), for petroleum-cracking plants and for high-pressure steam generation. "Hecla A. T. V." steel has been successfully used in a turbine operating with steam at 800° F. for long periods. E. G. R. A.

The application of aluminum, steel, VA-metals and iron-silicon alloys in nitric acid manufacture. III. Iron-silicon alloys. BRUNO WAESER. *Chem. Fabrik* **1928,** 544-5.—Review from the literature of the compn, physical properties and corrosion resistance of commercial Fe-Si alloys made in all countries. The trade names of the metals discussed are Neutraleisen, Acidur, Agdiron, Esilit, Thermisilid, Antacid, Wegucid, Kiesel, Duracid, Elektrosilit, Superneutral, Elianit, Tantiron, Duriron, Corrosiron, Ironak, Narki, Delhi, Cyclops No 17 and Silicrome. G. B. TAYLOR

New methods of corrosion testing. J. CZOCHRALSKI AND E. SCHMID. *Z. Metallkunde* **20,** 1-7(1928).—Heat-treated and cold-worked Al and Cu and cold-worked brass wire were immersed under tension in corroding media consisting of 30% NaOH, 7.5% HCl and 2.5% $CuCl_2$ for Al; 25% HNO_3, 10% $(NH_4)_2S_2O_8$ and 8.3% $CuCl_2.NH_4Cl$ + NH_3 for Cu; and 17% HCl for brass (Cu 57.9%, Zn 40.4%, Pb 1.7%). The temps. were 20° for Al and Cu and 50° for brass. Curves of time *vs.* breaking load and extension data are given. The breaking loads and extensibility decrease with time of immersion. Brass is dezincified in HCl. The dezincification uniformly progresses to the center of the wire Breaking loads predicted from analyses of corrosion products are in most cases higher than those actually observed, showing that the attack is not all on the surface of the metal, but also occurs between crystals. The smallest discrepancies were observed in NaOH; the largest in $CuCl_2$. Hard Al was less rapidly attacked than the heat-treated metal, while the reverse was noted in Cu. $(NH_4)_2S_2O_8$ caused the greatest discrepancies in the soln of Cu. Dezincification of β-brass preceded that of the α-metal. It is concluded that measurements of loss in wt. and of diam. decrease do not give adequate information regarding the changes in mechanical properties of corroded metals. B. E. ROETHELI

Oxidation of iron in water by the action of oxygen and carbon dioxide. N. M. GAVRILOV, S. K. MEL AND P. K. MEL. *J. Chem. Ind.* (Moscow) **5,** 697-700(1928).—The *mechanism of Fe corrosion* is believed to be as follows: (1) The surface of Fe being mechanically or chemically freed of oxides, the metal immediately becomes covered by a film of the lower oxide on contact with air in presence of water; (2) after a while the oxidation goes further with formation of $Fe(OH)_3$; (3) then the adhering film of $Fe(OH)_3$ is gradually reduced by the adjacent Fe with simultaneous oxidation of the latter, (4) By the action of water satd. with CO_2 on metallic Fe the following 2 reactions take place: (*a*) rapid soln of low oxides which are on the surface of the metal, and (*b*) slow soln. of Fe in CO_2; (5) Fe $(HCO_3)_2$ which dissolves is oxidized by O to $Fe(OH)_3$, this reaction being favored by the decrease of partial O pressure and by the temp. increase; (6) after remaining for a long time under a $Fe(HCO_3)_2$ soln. and being subjected to the action of the gas Fe becomes quasi-passive, but vigorous shaking detaches the film of oxides from Fe and the activity of the metal is restored; (7) if gases with a high O content (5%) are blown on to Fe covered with water, the metal surface becomes covered with insol. oxides while the expt is still under way, and the concn. of Fe in the soln. is lowered; (8) the most favorable conditions of Fe corrosion are attained in operating with a gas contg. not more than 5% O and not less than 14-15% CO_2, the temp. being low; in case of a drop of concn of $Fe(HCO_3)_2$ in the course of the operations the activity of the Fe can be restored by leaving it for some time under fresh water.

BERNARD NELSON

The use of aluminum in the manufacture of equipment. H. BACH. *Metallborse* **17,** 985-6, 1044-5, 1100-1, 1157, 1213-4, 1269, 1380-1, 1491-2, 1547-8; *Chem. Zentr.* **1927,** II, 1075-6.—A report on the corrosion of sheet Al by "activin" (no corrosion under practical conditions), aqua ammonia (strong corrosion), NH_4 compds. (of those investigated NH_4Cl solns. are most corrosive), "antiformin" (highly corrosive even in dil. soln.), dil. HNO_3 and mixts. of HNO_3 and H_2SO_4 without H_2O (Al is more resistant to dil. KNO_3 than brass, while with the other corrosive mixts. Al lies between Cu and brass), beer and soda water (no corrosion), chloride of lime solns. (considerable corrosion with a 0.4% soln.), K_2CrO_4 and $K_2Cr_2O_7$ solns. (no corrosion with 1-10% solns. neither cold nor hot), chromic acid (corrosion increases with concn. and temp.), acetic acid (the cold acid attacks soft annealed samples less than hard annealed samples,

while the hot acid frequently attacks the soft annealed samples more), formaldehyde and furfurole (slight corrosion with hot formaldehyde, no corrosion with either hot or cold furfurole), tanning solns. (no action), hanging in greenhouses (no action), Glauber's salt and K salt solns. (only slight reaction), CaC_2O_4 (strong reaction), copal (no reaction in contrast with Cu), $CuSO_4$ and $ZnSO_4$ solns. (strong reaction), lysol (no reaction at room temp. and only a slight reaction at 60–70°), lactic acid solns. (no reaction with dairy products since their lactic acid content is too low), Na_2SO_4 (slight reaction), oxalic acid solns. (no reaction with low concns. in the cold, very considerable reaction with higher concns. when hot), ozonized air (no reaction), phosphoric acid solns. (corrosion increase with increasing acid concn.), salicylic acid (the dry acid does not attack Al, when moist it reacts in the cold after a long time), nitroglycerin (no attack), explosives (confirmation of the favorable behavior with nitroglycerin, relatively slow reaction with 104% oleum and a much more rapid reaction with weaker H_2SO_4), cabinet makers' glue (no reaction), transformer oil (no reaction), $ZnCl_2$ solns. (do not corrode Al as much as Fe), citric acid solns. (very slight reaction in the cold, appreciably more when hot), sugar and its sources (losses in wt. are influenced mechanically; chemical action is considerable when Al comes into contact with limed liquors, neutral liquors induce practically no change). J. S. REICHERT

The corrosion of metals and of light metals by motor fuels. SCHMIDT. *Auto-Technik* **16,** No. 51, 7–9; *Chem. Zentr.* **1927,** II, 1615.—Expts. were carried out on the corrosive action of benzine, C_6H_6, 96% EtOH and 50·50 and 30:70 C_6H_6-EtOH mixts. on steel, Cu, brass, Al, duralumin, Mg and riveted combinations of these metals to det. a satisfactory protective material for fuel tanks. EtOH and EtOH mixts. were the only fuels which corroded all the metals. If there was no effect after 24 hrs., there was none after 6 months. In a further discussion, the influence of water (without which benzine does not mix with EtOH), the harmful results of using metals of different potential, the extensive corrosion of Pb-lined tanks with C_6H_6, and of tinned tanks with EtOH, and the importance of detg. the purity of fuels and the absence of certain compds. are all emphasized. C. C. DAVIS

The corrosion of aluminum. C. PROKEŠ. *Chemický Obzor* **1,** 349–58; *Chem. Zentr.* **1927,** II, 974.—The corrosion of Al by H_2O, inorg. and org. acids, halogens, org. and inorg. halogen compds., as $FeCl_3$, NaCl, $SnCl_2$, $(CH_2Cl)_2$, $Cl_2C:CHCl$, etc., is discussed. The influence of lyes, NH_4 salts, Me_2CO, C_2H_2, alkaloids and alcs. is described. G. SCHWOCH

External corrosion of copper and brass service pipe. K. H. LOGAN AND S. P. EWING. *J. Am. Water Works Assocn.* **20,** No. 3, 390–403(1928).—A preliminary report. After being buried two years, inspection showed the test pieces well able to stand such exposure. Where steel, Cu, or brass were in contact there was little indication of galvanic action. D. K. FRENCH

Cause of the corrosion and destruction of zinc coating galvanizing pots. WALLACE G. IMHOFF. *Am. Metal Market, Mag. Sect.* **35,** No. 179, 1–6, 16(1928).—Rapid corrosion of a galvanizing pot is usually due to too high a temp. The dissolving power of molten Zn for Fe is low up to 900° F., but rapidly increases above this temp. The proper temp. for galvanizing lies between 840° and 885° F. Pure iron pots are more resistant to corrosion at high temps. than steel. Increase in the Si content of the steel favors corrosion while increase in the C, Mn and P content has no effect. The Fe-Zn alloy formed at high temps. is non-ductile, non-coherent, non-malleable and readily breaks up into small crystals which float off into the molten Zn, exposing a fresh surface of the pot to the alloying action of the Zn. The development of the alloy crystals is from the boundaries toward the center, forming hexagonal crystals. The higher the temp. the larger are the crystals. J. W. SHIPLEY

Investigations of the action of alkalies and various salts on iron. K. TAUSSIG. *Arch. Wärmewirt.* **8,** 337–40(1927).—A critical résumé of the work of Berl, Staudinger and Plagge (*Ver. deut. Ing. Forschungsarbeiten* **295** (1927)) on the action of solns. on Fe at high temp. and pressures. ERNEST W. THIELE

The chemical bases for the inoxidation processes. Thermal, gas-analytical and metallographical results. E. PIWOWARSKY. Tech. Hochschule, Aachen. *Giesserei Z.* **15,** 177–80(1928).—Objections to the investigations of others, due to the use of old inoxidation ovens, are eliminated in this investigation. Good inoxidation is obtained by annealing 2.5–3 hrs. at 800–880°. At and above 900° defective spots develop. Gas analyses give no rule for detg. the best gas compn. for inoxidation. Much more O_2 is consumed for the formation of the inoxide during the oxidation process than during the reduction. The oxidation appears to be greatly influenced by the amt. of H_2 in the gas phase. Microscopic examn. shows that an inoxide film consists of (1) an outer

zone, probably Fe_3O_4, made up of a bright, homogeneous, non-metallic material, and (2) an inner zone, assumed to be FeO, consisting of a bright zone (similar to the outer) cut or surrounded by a darker net-work. The latter forms a good binding material between the protective outer layer and the metal. With increase in the duration of the annealing, the thickness of the outer zone and the amt. of bright material in the inner increases, until finally they disappear entirely. The limits of the film thickness are 0.12–0.065 mm., the usual thickness being 0.085–0.075 mm. The thickness depends on the C content of the material and on the length of treatment. Both cast and wrought Fe inoxidize well; under similar conditions, however, the outer zone of the inoxide film of the latter is more homogeneous and thicker. With longer times of annealing, specimens which are not heavily rusted may be inoxidized well. J. B.

Silica brick in the open-hearth furnace (Larsen) **19.** Steel mill lubrication (Mallison) **22.** Kaolinic refractories (Terman) **19.** Laboratory furnace for testing resistance of firebrick to slag erosion (Hursh, Grisgsby) **19.** Magnesite [Mg and alloys] (Henton) **18.** Production and hardening of building materials of slag (Huth) **20.** Ra, U and V (Anon.) **3.** The acid resistance of bronzes in sulfite pulp mills (Rauchberg) **23.** Crystal orientation in cast plates of metals (Vogel) **2.** Specific gravity indicators (Spaulding) **1.** Tensile properties of crystals of an "ennobled" alloy (Karnop, Sachs) **2.** The reduction of metallic sulfides with carbon (Parravano, Malquori) **6.** Metallic alloys in the mineral-oil industry (Magnus) **22.** Copper in medicine and industrial pathology (Mazzi) **11H.** Application of thermomagnetic analysis to the chemistry of Fe (Huggett, *et al.*) **2.** The magnetization of single crystals of Ni (Kaya) **2.** Refractories for blast furnaces (Bodin) **19.** Results obtained with Al transmission lines (Schmitt) **4.** The application of theoretical chemistry to some of the important processes in the production of steel (Schenck) **2.** Apparatus for gravity separation of coal and ore constituents (U S. pat. 1,686,435) **21.** Apparatus for grading ores (Fr. pat. 635,240) **1.** Briquetting ores, etc. (Brit. pat. 284,418) **13.** Method and apparatus for gravity separation of ores (U. S. pat. 1,685,521) **13.** Treating polluted acid wastes [from steel mills] (U. S. pat. 1,685,300) **14.**

Granjon, R. and Rosemberg, P.: **Traité de soudure autogène et d'oxy-coupage.** Paris: Publications de l'Office Central de l'Acétylène et de la Soudure Autogène. 320 pp.; F. 15. Reviewed in *Chimie et industrie* **20**, 595(1928).

Weinig, Arthur and Palmer, Irving A.: **The Trend of Flotation.** 2nd ed. revised. Golden, Colo : Colorado School of Mines. 90 pp. Reviewed in *Eng. Mining J.* **126**, 354(1928).

Steel alloy for permanent magnets. E. Pakulla. U. S. 1,661,907, March 6. High-speed steel contg. Cr and at least one of the elements W, Mo or Co is heated (suitably at about 1100–1150°) at a temp. above lowering temp., and is quenched in oil or other mild non-aq. hardening agent.

Mineral flotation. Arthur H. Fischer (to Guggenheim Bros.). U. S. 1,684,536, Sept. 18. Flotation is effected in the presence of a water-repellant reaction product of a metal xanthate and an acid chloride, *e. g.*, the reaction product from K ethyl xanthate and ethyl chlorocarbonate, acetyl chloride, $COCl_2$ or SO_2Cl_2.

Froth-flotation ore concentration. Rhetherford B. Martin (to Minerals Separation North American Corp.). U. S. 1,686,529, Oct. 9. A suitably ground sulfide ore pulp which may contain Zn as found in Butte and Superior ore is agitated with a mineral-frothing agent such as pine oil and K xanthate and with a compd. of aniline or benzidine with $CuCl_2$ or other suitable org. compd. carrying N and Cu and capable of assisting in the selective flotation. Cf. *C. A.* **22**, 3386.

Ore concentration by flotation. A. H. Fischer (to Guggenheim Bros.). Brit. 284,198, Jan. 24, 1927. Flotation is effected in the presence of a product of reaction between a metal xanthate and an acid chloride which may be dissolved in oils such as kerosene and used in an acid or alk. flotation circuit in the presence of frothing agents such as cresylic acid or pine oil. K ethyl (or Am, Bu, Pr or aryl) xanthate may be acted on by ethyl chlorocarbonate in the presence of alc. or by AcCl in the presence of CCl_4 or by a soln. of $COCl_2$ in toluene or by SO_2Cl_2 in the presence of alc. to form the xantho compds.

Concentrating oxidized ores and minerals. Frank A. Bird. U. S. 1,686,064, Oct. 2. In order to render oxidized ores such as those of Pb, Zn and Fe amenable to flotation concn., the ore is ground in a mill free from metal surfaces likely to contact

with the ore, and is then subjected to the action of a sulfidizing agent to form a film of sulfide on the ore particles.

Briquetting and reducing sulfate minerals. JAMES E. BOOGE and JOSEPH P. KOLLER (to E. I. DuPont de Nemours & Co.). U. S. 1,685,772, Oct. 2. A powd. sulfate ore such as barytes contg. more than 4% of silica is formed into tablets or briquets with coal and a binder such as waste sulfite liquor which depends upon its coking properties for its binding action, and these tablets or briquets are heated to produce sulfide.

Apparatus (with a reciprocating table) for concentrating ores. MERLE M. NEWTON. U. S. 1,685,644, Sept. 25.

Centrifugal apparatus of the vertical type for concentrating and amalgamating placer gold, etc. FRANK D. LEWIS. U. S. 1,684,870, Sept. 18.

Centrifugal ore separator. EDDIE H. STEPP. U S. 1,685,466, Sept. 25.

Magnetic ore separator. WM. L. MCADAMS. U. S. 1,686,917, Oct. 9.

Roasting and sintering ores. COMPAGNIE DES METAUX OVERPELTLOMMEL. Brit. 284,248, Jan. 26, 1927. Ore or similar material is brought to a suitable S content and then moistened and compressed, with or without a binder such as org. material or $FeSO_4$ or H_2SO_4, then fed through an extrusion press for production of threads which break into small grains; the latter are dried and sifted, and then roasted as a thin layer or sintered on the grate of a blast app. App. is described.

Open-pan sintering apparatus (with tiltable pans) for sintering ores. P. ANDERSON. Brit. 284,793, Nov. 9, 1926.

Treating metal-bearing residues. M. MEYER and L. MEYER (trading as Huttenwerke Tempelhof A. Meyer). Brit. 285,462, Feb. 17, 1927. Residues contg. Sn, Sb, Pb and Cu as oxides are treated with dil. H_2SO_4 to remove the Cu as sulfate; the $PbSO_4$ formed is mainly removed as chloride by use of hot chloride solns., and the residue is melted with caustic alkali and alkali chloride to produce a mixt. of alkali stannate, plumbate and antimonate. By lixiviation with water the antimonate remains as a residue, and Pb may be pptd. as PbS from the soln. obtained. Brit. 285,463 specifies treating residues contg. Sn, Sb, Pb and Cu partly as oxides and partly in metallic form by melting with caustic alkali and alkali chloride, sepg. the unchanged metal as a regulus, and further sepg. the stannate, antimonate and plumbate formed by lixiviation and pptn. treatments, and finally converting the Cu oxide residue obtained into sulfate.

Briquetting powdered iron ore or concentrate. P. GREDT. Brit. 285,040, Feb. 9, 1927. The raw material is mixed with powd. coke, semi-coke, coal or charcoal, crushed reduced ore and with material such as $MgCl_2$ or HCl which forms an oxidized compd. or salt with the reduced raw material.

Iron from ore. VEREINIGTE STAHLWERKE A.-G. Brit. 284,991, Feb. 7, 1927. Ores are treated with Cl or Cl-contg. substances such as vaporized HCl to form $FeCl_3$ and the $FeCl_3$ is then reduced at a temp. of 300–500° with H. The chlorination may be facilitated by use of pressures above 10 atm. and, before reduction, the $FeCl_3$ is freed from water. Spongy Fe may be added to serve as a catalyst in the reduction and oxide remaining in the product may be returned for further treatment after a magnetic sepn. of the Fe. $MgCl_2$ or NH_4Cl also may be used in the chlorination, and a preliminary treatment with Cl or HCl at 100° may be applied to the ore to remove As or Sb from ores contg. them.

Apparatus for recovery of metal values, etc., from fumes such as those produced in zinc smelting. MORTON I. DORFAN (to Allis-Chalmers Mfg. Co.). U. S. 1,685,229 Sept. 25.

Smelting apparatus (with a centrifugal extractor) suitable for the treatment of ores of mercury or tin. CHARLES E. GLESSNER. U. S. 1,686,912, Oct. 9.

Cyanide process. SIBLEY B. MCCLUSKEY. Can. 283,696, Oct. 2, 1928. Precious metals are sepd. from their ores contg. cyanicides, by crushing the ore in cyanide soln., expelling substantially all the cyanide from the pulp in the form of HCN gas, pptg. the cyanicides in alk. soln. and restoring expelled gases to the pulp in the presence of an excess of alkali. Cf. *C. A.* **22,** 2544.

Precipitating heavy metals from ammoniacal solutions. CARL MÜLLER, LEO SCHLECHT and WALTER SCHUBARDT (to I. G. Farbenind. A.-G.). U. S. 1,686,391, Oct. 2. Solns. such as those contg. Ag and Cu are treated with a reducing gas, *e. g.*, water gas, while heated and under pressure to effect practically complete pptn. of the metals such as Ag and Cu. Ni, Co and Zn are also mentioned.

Melting and refining copper. HARRY H. ALEXANDER. U. S. 1,687,277, Oct. 9. Hot combustion gases are impinged against the surface of a charge of hot Cu and the Cu is progressively melted while subjected to a purifying atm. which is controlled by

regulating the quantity of air and fuel used in formation of the combustion gases, in accord with the nature and compn. of impurities present in the Cu (which may be removed by oxidation); this regulation is based on periodic detns. of the character and quantity of the impurities in the Cu. An app. is described.

Refining and casting copper. Copper Deoxydation Corporation. Fr. 635,673, May 24, 1927. In the treatment of Cu it is kept out of contact with combustion gases and reagents are added to eliminate S, O and H. The Cu is preferably heated electrically.

Refining lead bullion. George K. Williams. U. S. 1,687,188, Oct. 9. See Brit. 267,104 (*C. A.* **22,** 1129). U. S. 1,687,187. See Brit. 267,105 (*C. A.* **22,** 1129).

Purifying lead. Wilbur H. Judy (to Sumet Corp.). U. S. 1,686,277, Oct. 2. H (with exclusion of O) is introduced into the mass of molten metal, to remove S and render the Pb suitable for alloying with Cu and Sn.

Lead and zinc extraction. Friedrich Johannsen (to Fried. Krupp Grusonwerk A.-G.). Can. 283,425, Sept. 18, 1928. Pb and Zn are extd. from Pb-Zn ores by treatment in 2 sep. working stages, in which the materials are rolled around or tumbled about in a furnace, the Pb being first volatilized under purely oxidizing conditions, the residue from the oxidizing process being then submitted with reducing agents to a further process of volatilization, the gaseous products of the two processes being collected separately, so that a Zn-free Pb product and a Pb-free Zn product are obtained.

Working zinc. Walter M. Towne (to E. W. Bliss Co.). U. S. 1,686,353, Oct. 2. In forming cups or similar Zn articles the metal is pressed between dies and extruded through an annular opening at temps. of 150–300°.

Metallic thorium. Wm. B. Gero (to Westinghouse Lamp Co.). U. S. 1,685,915, Oct. 2. In compacting Th or similar rare refractory metals, the metal while in a coherent state is subjected to pressure and the flow of the metal while being pressed is subjected to a yielding restraint, *e. g.*, by use of a surrounding body of soft metal such as Pb, Al or Cu during the pressing.

Uniting ferrous and cuprous metals. Willis R. Whitney (to General Elec. Co.). U. S. 1,685,657, Sept. 25. The regions to be joined, while pressed together, are brought into contact, in a reducing gas, with a molten alloy of Cu and Ag. The process is suitable for use in joining Cu cooling fins to cylinders of air-cooled engines.

Castings. Vereinigte Stahlwerke A.-G. Fr. 635,907, June 13, 1927. Castings of high quality are obtained by allowing the crude casting to solidify as white cast iron in casings instead of sand and artificially cooling by means, for instance, of a spray of water. Cf. *C. A.* **22,** 1754.

Casting metal articles such as pistons in permanent molds. Harry S. Lee. U. S. 1,685,545, Sept. 25. In making pistons or other castings a mold is used having walls with locally thickened portions to "choke back the heat" and reduce the heat cond. at these portions of the mold. U. S. 1,685,546 specifies regulated application of a cooling fluid to certain portions of the exterior of the mold.

Casting chilled rolls. C. O. J. Broms. Brit. 284,337, Jan. 29, 1927. Various details of a casting operation are specified, in which a non-chilled portion of rolls is cast after a suitable thickness has solidified in the chill mold.

Centrifugal casting of iron pipe or other cylindrical metal bodies. Michael C. Smotzer and John A. Byers (to James B. Clow & Sons). U. S. 1,684,419, Sept. 18. Mech. features.

Casting articles of "corrosion-proof" steel. Friedrich Hauptmeyer (to Fried. Krupp A.-G.). U. S. 1,684,700, Sept. 18. The steel to be melted is embedded in a receptacle and covered with a deoxidizing flux, and is melted down and cast through a closed channel in a closed mold. The walls of the receptacle, channel and mold are formed of material such as clay which is free from C and the charge is melted by an open flame.

Apparatus for casting metals under pressure. Erik Jorgen-Jensen. U. S. 1,684,994, Sept. 18.

Apparatus for making castings under pressure in a plurality of molds with a single pressure-casting machine. S. Junghans. Brit. 284,256, Jan. 26, 1927.

Apparatus for casting bell-flanged pipe, etc. William H. Millspaugh (to Paper and Textile Machinery Co.). U. S. 1,686,624, Oct. 9.

Alloy surface for castings. Roger Williams (to The Electro Metallurgical Co. of Can., Ltd.). Can. 283,748, Oct. 2, 1928. A mold for steel or Fe castings is coated to 1/8 of an in. while green with comminuted Cr contg. 2.0% of NaF and a binder (such as linseed oil, molasses, etc.). The mold is dried and baked to 600–700° F.; the coating

hardens and adheres to the surface of the mold. The metal is then poured into the mold and casting made.

Sand mold for casting magnesium, etc. GILBERT MICHEL (to Hart O. Berg). U. S. 1,685,553, Sept. 25. Sand for prepg. molds is incorporated with a soln. of rosin in a hydrocarbon oil or other suitable non-aq. oily vehicle and $C_{10}H_8$.

Preparation of cores and molds for metals from liquid-hardening material. CYRILL AUER. Austrian 109,181, Nov. 15, 1927. The cores or molds are cast from a mixt. of water, gypsum, sand and S which is filled into a mold and compressed to remove the excess of water.

Chromium coating for castings. WALTER M. MITCHELL (to The Electro Metallurgical Co., of Can., Ltd.). Can. 283,747, Oct. 2, 1928. A mold for steel castings is coated while green to a depth of $^1/_8$ of an in. with coarse comminuted Cr (15 to 40 mesh) mixed with a binder (silicate of soda soln.). When the coat has set, but before being baked, a second coat of $^1/_{16}$ of an in. of comminuted Cr (80 to 100 mesh) mixed with a binder to form a paste is applied to selected portions of the mold, which is then dried and baked. This second coat prevents denuding the selected portions during pouring of the casting metal. Cf. *C. A.* **22,** 3387.

Copper coating on stereotype plates. COLBY C. WALLER. U. S. 1,684,565, Sept. 18. A fibrous blank is impregnated with an emulsion contg. $CuSO_4$, hydrous Al silicate, boiling water and gum arabic, the matrix is impressed with the desired characters at a temp. of about 115°, molten type metal is cast against the matrix and the casting is removed and cleaned.

Sound ingots. KOTARO HONDA. Fr. 635,942, June 14, 1927. The fused metal is poured into an iron mold, almost to the top, and melted slag is afterwards poured into a raised portion placed on the mold as soon as possible after the metal has been poured, to furnish a supplementary source of heat and pressure to the top of the ingot.

Soaking pit. HERBERT C. RYDING. Can. 283,823, Oct. 2, 1928. A soaking pit for heating ingots.

Bearing metal. EUGEN VADERS. Can. 283,721, Oct. 2, 1928. Alloys for use as bearing metals contain Cu 78.5–92.8, Al 5–9.5, Mn 1–6, Fe 0.1–3 and Ni 0.1–3%. Cf. *C. A.* **21,** 888.

Porous metals for bearings, etc. GENERAL MOTORS RESEARCH CORP. Brit. 284,532, June 15, 1927. Metals which do not completely alloy together are heated with graphite and another de-oxidizer; *e. g.*, a suitable mixt. may be formed of Cu 90, Sn 8, Pb 10, phosphor-Sn 2, graphite 6 and salicylic acid 2–4 parts.

Refractory metals. NAAMLOOZE VENNOOTSCHAP PHILIPS' GLOEILAMPENFABRIEKEN. Brit. 284,990, Feb. 7, 1927. In a process such as is described in Brit. 200,879 (*C. A.* **18,** 374) the atm. employed contains N in addn. to the volatile metal compd. An app. is described in which W wire may be treated with N and WCl_6 which may be heated by a bath of mixed K and Na nitrates.

White metal. OSKAR GRÜNBAUM. Austrian 109,161, Nov. 15, 1927. A white metal comprising Pb, an alkali metal and Zn contains up to about 5% of alkali metal and an amt. of Zn equal to 0.47–1.5 times the amt. of alkali metal.

Centrifugal apparatus for continuous mixing of finely divided metals with other pigment materials, etc. M. RAGG and F. RAHTJEN. Brit. 284,172, Oct. 1, 1927.

Gas furnace for reducing ores. LUIGI BAROSSO. Ital. 249,911, June 22, 1926.

Metallurgical furnace suitable for melting metals. HOWARD BUTT (to Riley Stoker Corp.). U. S. 1,687,470, Oct. 9.

Vertical shaft furnace for producing metals or alloys from finely divided ores. D. CROESE. Brit. 284,459, Jan. 20, 1927.

Furnace for heat-treatment of sheet metal, etc. JOSEF HIRSCHMANN (to Eastern Rolling Mill Co.). U. S. 1,686,696, Oct. 9.

Blast furnace charging apparatus, etc. FREDERICK H. WILLCOX (to Freyn Engineering Co.). U. S. 1,685,208, Sept. 25.

Checkerwork construction for open-hearth and blast furnaces. FRED H. LOFTUS. U. S. 1,686,826, Oct. 9.

Rotary furnace suitable for calcining processes. ERNST AMME, KARL DIENST and DAVID J. UHLE. U. S. 1,685,972, Oct. 2. Stuctural features.

Rotary furnace for roasting pyrites, etc. METALLBANK UND METALLURGISCHE GES. A.-G. Brit. 284,731, Feb. 4, 1927. The furnace is divided into a plurality of compartments by transverse partitions carrying ribs, projections or guide members which serve to scatter the ore and to bring it into more intimate contact with the roasting air. Various structural details are described.

Cast iron. WERNER STAUFFER. Fr. 635,811, June 11, 1927. A cupola of cast

iron of superior quality and slightly carbonized is made from a melt contg. more than 30% steel and less than 50% crude cast iron and pieces of cast iron, with additions of Si and Mn. The blast is regulated to any desired quantity between 80 and 120 cu. m. per min. for each sq. m. of cupola.

Foundry iron. FRIED. KRUPP A.-G. Fr. 635,924, June 13, 1927. See Brit. 274,035 (*C. A.* **22,** 1946).

"Synthetic" pig iron. EMIL EDWIN (to Aktieselskapet Norsk Staal (Elektrisk-Gas-Reduktion)). U. S. 1,686,075, Oct. 2. See Can. 283,386 (*C. A.* **22,** 4102).

Wrought iron. GEORG G. GEDDA. U. W. 1,685,602, Sept. 25. Ni or Co is added to ordinary pig iron and the mass is so heated and puddled as to produce a wrought iron of "increased" tensile strength and elastic limit without decreasing its welding and contraction capacities. Cf. *C. A.* **21,** 3342.

Refining iron or steel. A. A. FREY. Brit. 284,976, Feb. 5, 1927. The metal is first melted under basic and reducing conditions in an open-hearth or elec. furnace and the slag is removed; the molten metal is then heated under basic and oxidizing conditions either in the same furnace or in a converter and the slag removed, and the metal thus produced is treated in a converter with a reducing gas such as H. An app. and various mech. details are described.

Refining iron and steel. CHARLES W. HILL. U. S. 1,686,087, Oct. 2. Regulated and controlled vols. of gases such as O or air or H are forced into the molten metal while controlling the temp. and pressure of the molten metal so as to control the amt. of gases absorbed and the character of the metal produced. An app. is described.

Coating iron or steel with other metals. R. PALMER (to British Thomson-Houston Co., Ltd.). Brit. 284,302, Jan. 27, 1927. Before plating iron or steel with a metal such as Ni which readily alloys with and penetrates the iron on heating, the iron or steel is coated with another metal such as Cu which is less sol. in the Fe, and, after the second coating, the body is heated in an inert or reducing atm. to the alloying temp. Also, Cr or W may be coated onto an intermediate layer of Cu, and Ni onto an intermediate layer of Ag. It is also stated that Ni may be plated on Cr, W on Ni, and Cr on W, employing in each case an intermediate layer of Cu. The Cu may if desired be deposited by nonelectrolytic action such as by tumbling the iron in $CuSO_4$.

Steel. JOSEPH R. C. MARSH (to Francis N. Bard). U. S. 1,684,841, Sept. 18. A stream of molten metal is added to loose flake graphite in such a state of subdivision as to be highly mobile so that the molten metal will form an intermixed current of graphitic material and metal, rapidly and completely to carburize the metal.

Steel. ELECTRO METALLURGICAL COMPANY. Fr. 635,911, June 13, 1927. An alloy of steel contains 1 to 2% Mn, less than 1% C and Zr. The content of C is preferably less than 0.7%, and the Mn and C together not more than 2.5%. The steel obtained is 20% superior to a similar steel not contg. Zr. Cf *C. A.* **21,** 729.

Steel. GRANULAR IRON COMPANY. Fr. 635,692, June 8, 1927. Fe ore is reduced without fusion, and the Fe is put into an elec. furnace, where it is melted, any desired addns. being then made.

Titanium steel. WALTHER MATHESIUS. Can. 283,690, Oct. 2, 1928. An Fe alloy practically free from C has a content of Ti sufficient to form a steel, but below the amt. which would render the alloy unforgeable; other metals known to improve the properties of steel are also present.

Tempering steel. OTTO KRÖNING and RUDOLF BOËS. Fr. 635,695, June 9, 1927. A hard steel is obtained by a simple chilling in juice of onions or the like previously treated with acids and chlorinated. Thus, a suitable liquid is a mixt. of 94 parts onion juice, 4 parts AcOH and 2 parts $CaCl_2$.

Increasing the resistance of steel wires. VEREINIGTE STAHLWERKE A.-G. Fr. 635,487, June 3, 1927. See Brit. 272,240 (*C. A.* **22,** 1754).

Apparatus for testing the homogeneity of steel rods or other magnetizable objects. MAX E. BERLOWITZ (to Magnetic Analysis Corp.). U. S. 1,686,676, Oct. 9.

Apparatus for testing the properties of steel taps, drills or other magnetizable objects. CHARLES W. BURROWS (to Magnetic Analysis Corp.). U. S. 1,686,679, Oct. 9.

Magnetic system for testing the physical properties of quenched hardened steel articles or other magnetizable objects. ELMER J. IMES (to Magnetic Analysis Corp.). U. S. 1,686,815, Oct. 9.

Magnetic device for testing welded seams of iron or steel or other metals. THOMAS SPOONER (to Westinghouse Elec. & Mfg. Co.). U. S. 1,685,965, Oct. 2.

Hydraulic testing and heating treatment of drums for steam boiler plants or other hollow metal articles. VEREINIGTE STAHLWERKE A.-G. Brit. 285,449, Feb. 17, 1927.

Testing apparatus for measuring and recording comparative effects of heating

articles such as those of steel for the purpose of determining suitable heat treatments. ROLAND B. ALEXANDER and WILLIAM H. ROWAN. U. S. 1,685,973, Oct. 2.

Apparatus for rustproofing iron bands by passing them through a bath of heated oil or grease. C. RÖTZEL and G. KRUG. Brit. 284,191, Jan. 22, 1927.

Preventing corrosion of copper apparatus by organic acids. SOC. CHIMIQUE DES USINES DU RHONE. Brit. 284,685, Feb. 4, 1927. Free O or materials such as Cu acetate which promote oxidation are removed from materials coming into contact with Cu by electrolysis, pptn. or use of various reducing agents. *E. g.*, dil. HOAc to be concd. in Cu app. may be passed through Fe turnings to remove Cu acetate and dissolved O.

Production of a layer of aluminum on metals. METALLBANK UND METALLURGISCHE GES. A.-G. Fr. 635,996, June 15, 1927. Diffusion layers of Al are produced on metals such as Fe or Cu by treatment with a hardening powder contg. 8–30% Al. The powder is prepd. by adding to an indifferent agent, such as clay or alumina, 8% of Al or Al alloys, and heating the mixt. in an indifferent atm. to 700–1200°, while adding more Al to the desired quantity. $(NH_4)_2CO_3$ or double salts such as NH_4 ferrous chloride may be added to the powder.

Treating tin plate scrap. L. U. LA CORSA. Brit. 284,691, Feb. 5, 1927. Tin plate scrap is leached with a soln. of a ferric salt such as $FeCl_3$ and electrolyzed for recovery of Sn. $FeCl_3$ and NH_4Cl are preferably used together for the leaching and Cl may be passed through the soln. $FeSO_4$ together with $(NH_4)_2SO_4$ also may be used for the solvent soln. Various details are given.

Cupola for alloys. EUGEN PIWOWARSKY. Fr. 635,338, May 31, 1927. The lower part of a cupola for alloys of Fe poor in C is conical with very small cross-section towards the base, and this part is filled with graphite to lessen the absorption of C

Alloy. WILLOUGHBY S. SMITH and HENRY J. GARNETT. Can. 283,647, Oct. 2, 1928. A C-free alloy suitable for loading telephone conductors comprises Ni 30–33, Fe 58–65, Cu 2–6 and Mn not exceeding 1%. It is annealed in an atm of N at 850–950° and cooled in an atm. of N. Cf. *C. A.* **22**, 2917, 3623.

Alloys of chromium. ELECTRO METALLURGICAL COMPANY. Fr. 635,581, June 7, 1927. See Can. 282,700 (*C. A.* **22**, 4102).

Metals or metal alloys low in carbon produced directly from ore. HENNING G. FLODIN and EMIL G. T. GUSTAFSSON. U. S. 1,686,206, Oct 2 Finely divided ore such as Fe ore is intimately mixed with finely divided carbonaceous material such as coal, coke or charcoal proportioned in quantity for the reduction of the ore and for the desired content of C in the product; this mixt. is formed into briquets together with water glass, molasses or other suitable binding agent and the briquets are fed in repeated quantities into an elec. furnace to effect an even reduction and regular operation in the course of which the material is reduced and melting is effected on top of a slag bath U. S. 1,686,207 specifies an endothermic direct reduction process for producing C binding metals and alloys such as iron or its alloys consisting in charging an elec furnace, having an electrode which can be raised and lowered and in which heat is thus developed by elec. resistance in the slag bath, with a solidified mixt contg finely divided oxide ore such as Fe and Cr ores and finely divided reducing agent in the desired proportion for reduction and carbonization, reducing and melting on a slag bath and controlling the temp. of the slag bath and of the metal by heating the upper layer of the slag bath and regulating the position of the electrode and passing an arc between the electrode and slag bath.

Alloys of high magnetic permeability. W. S. SMITH, H. J. GARNETT and J. A. HOLDEN. Brit. 284,789, Nov. 6, 1926. Alloys which may be heat-treated in various shapes to develop high magnetic permeability and which are suitable for loading signalling conductors contain Fe together with Ni 32–42, Si or Al 1–4%, and 1–4% of a material for increasing the elec. resistance such as Cr, W, Mo or V. Fe is preferably 55–65% and the alloys are free from or low in C, but may contain a small proportion of Mn or other deoxidizing metal. Cf. *C. A.* **22**, 2138, 3623.

Alloy for use in magnetic circuits of multiplier devices for high-frequency currents or other electrical devices. MARIUS LATOUR (to Latour Corp). U. S. 1,687, 298, Oct. 9. An alloy is used comprising Fe together with Ni 33.9 and Mn 1.15%.

Melting aluminum and aluminum alloys. A. I. GOLDMAN. Russ. 4343, Jan. 31, 1928. A flux composed of a mixt. of NaCl and more than 10% of $CaCl_2$ is used.

Aluminum alloys. A. GEYER. Brit. 284,722, Feb. 4, 1927. In producing Al alloys which may contain Cu, Mn, Si, Mg, Fe, C, W, Ni, Mo, Cr and Cd, oxidation of the molten bath is prevented by covering it with a layer of broken coal and by introducing powd. coal (which may be wetted) into the bath. Carbides, metal salts and reducing gases also may be used.

Aluminum alloys. Aluminum Company of America. Fr. 635,766, June 10, 1927. Al alloys which are liable to corrode are covered with an adhering layer of Al or non-corroding Al alloy by casting the melted Al alloy in contact with one or several plates of non-corroding metal and pressing and heating the combination thus formed.

Bronze alloy. Soc. metallurgica Giacomo Corradini. Fr. 635,540, June 4, 1927. A bronze alloy which can be worked hot or cold contains 50 to 60% Cu, 40 to 30% Zn, 0.25 to 1.5% Pb, 0.25 to 1.5% Fe, 2 to 6% Mn and 2 to 6% Ni.

Copper-tin-lead alloy. George H. Bender. U. S. 1,685,975, Oct. 2. An alloy which is suitable for bearings is formed of Cu 70.3, Sn 24.53 and Pb 5.2 parts.

Iron-chromium-silicon alloy. Percy A. E. Armstrong (to Ludlum Steel Co.). U. S. 1,686,223, Oct. 2. In making wrought articles contg. Fe with Cr about 13% or more, Si about 0.3-5% and C under 0.05%, degasified molten Fe is combined with preheated chrome alloy material, cast into ingots, worked to reduced size, heated to an initial rolling temp. of about 1140-1260° and the metal is finish rolled with substantially max. draft roll passes, the rolling being finished at a temp. about 600° or higher, to produce an article with a stable surface.

Magnesium alloy. Wm. R. Veazey (to Dow Chemical Co.). U. S. 1,685,653, Sept. 25. A Mg alloy contains Cr 0.1–1.0% which serves to give strength and toughness. Cf. *C. A.* **22,** 1569.

Bending magnesium alloys. I. G. Farbenind. A.-G. Brit. 284,313, Jan. 28, 1927. Section rods or sheets of Mg alloy are heated to 100-400° and bent by passing them through profiled rollers made of Mg alloy which may be hardened superficially as by hammering. Alternatively, ordinary rolls may be covered with rings of Mg alloy.

Drawing magnesium alloy section-bars. I. G. Farbenind. A.-G. Brit. 284,317, Jan. 28, 1927. A sheet of Mg alloy is drawn through skelping dies at a temp. of 100–400°. Various mech. features are described.

Extruding bars from magnesium alloys. I. G. Farbenind. A.-G. Brit. 285,029, Feb. 9, 1927. Mech. features.

Nickel alloys of high resistance. W. S. Smith, H. J. Garnett and J. A. Holden. Brit. 285,565, Nov. 17, 1926. Alloys are formed contg. Ni 70–80, Cr 15-25 and Co 2-7% and which may also contain up to about 10% of Fe which may replace some of the Cr and Ni. For making wire, tape or ribbons the alloy is made substantially C-free but for castings, rods or forgings 0.1–0.2% C may be present. Traces of a deoxidizer such as Mg or Cd also are preferably added.

Nickel-beryllium alloys. Georg Masing and Otto Dahl (to Siemens & Halske A.-G.). U. S. 1,685,570, Sept. 25. Alloys of Ni contg. up to 5% Be are improved by heating to above 700°, after cooling and afterwards mech working.

Steel alloys. F. Krupp A.-G. Brit. 284,314, Jan. 28, 1927. Steel alloys are formed contg. Cr 8–18, Mn 2-12, W 3-12, C up to 1% (*e. g.*, Cr 12-14, Mn about 5, W 5 and C 0.5% are suitable).

Alloy containing zirconium and copper. Alexander L. Feild (to Electro Metallurgical Co.). U. S. 1,684,696, Sept. 18. An alloy of Al and Zr is introduced into a superheated bath of Cu to form alloys which, *e. g.*, may be composed of Cu 63.47, Zr 10.59, Al 4.67, Si 4.43 and C 0.07 parts.

Zinc-lead dust. Minton H. Newell (to Alloys Co.). U. S. 1,687,034, Oct. 9. Zn is vaporized, Pb oxide is decompd. in the Zn vapor and the mixt. is then cooled with sufficient rapidity to condense the Zn in finely divided condition. An app. is described. The product obtained by this method is suitable for pptg. metals from cyanide solns.

Forming seamless turbine tubes, free from incipient cracks, from metal plates. Julius Grossweischede and Georg Reichenbecher (to Vereinigte Stahlwerke A.-G.). U. S. 1,685,402, Sept. 25. Mech. features.

Thermal cut-out for electric circuits. Maurits J. Sandin (to Westinghouse Elec. & Mfg. Co.). U. S. 1,685,958, Oct. 2. Structural features.

Heat treatment of permanent magnets. James E. Gee and Frederick S. Gee. U. S. 1,685,877, Oct 2. Before magnetizing, castings are softened by heating and then hardened by first heating to approx. 1200°, then cooling and leaving for about 18 hrs., reheating to approx. 750°, allowing to cool, and finally heating to about 1000° for 10 min., allowing to cool, and leaving for about 12 hrs. before magnetizing.

Corrugated container for annealing metals, etc. J. B. Green. U. S. 1,684,391. Sept. 18. Structural features.

Annealing stove for metallic wires. Akt. Ges. Brown, Boveri & Cie. Fr. 635,948, June 14, 1927. Metal disks which are good conductors of heat are placed between the layers of wire. When a crucible is used, its walls and sides are made of good conductors.

Galvanizing. FELIX KIRSCHNER and JOSEF HESS. Fr. 635,308, May 23, 1927. An app. is described for galvanizing articles in bulk.

Galvanizing apparatus. FELIX KIRSCHNER and JOSEF HESS. Austrian 109,151, Nov. 15, 1927. Constructional improvements are described in app. of the type comprizing a galvanizing vessel rotating around an inclined axis.

Electric welding. ALLGEMEINE ELEKTRICITÄTS-GES. Brit. 285,513, Feb. 18, 1927. In effecting resistance welding a higher voltage is used for the preliminary heating than for the actual welding. Numerous details of elec. app. are specified.

Welding high-carbon steel. JOHN H. DEPPELER (to Metal & Thermit Corp.). U. S. 1,686,603, Oct. 9. A thin body of low-C iron is interposed between surfaces which are then butt welded by contact with molten aluminothermic metal.

Electric arc welding apparatus. J. B. GREEN (to Chicago Steel & Wire Co.). U. S. 1,685,082, Sept. 25.

Electrodes for arc welding. B. TURNER and FERRO-ARC WELDING CO., LTD. Brit. 285,128, Nov. 9, 1926. A twin electrode for use with a. c. consists of 2 rods or wires bound together with asbestos yarn and which may carry fluxes such as lime, china clay, Na silicate or Na_2CO_3. Brit. 285,129 also specifies generally similar electrodes.

Electrodes for arc welding with alternating current. K. V. PETRAN. Russ. 4361, Jan. 31, 1928. Iron wire is heated rapidly to a high temp. (*e. g.*, 950°), cooled, the scale removed by HCl, the acid washed off with H_2O and the electrodes are kept in a soln. of soda (*e. g.*, 5%) until they are coated with special flux.

Welded steam-generator drums or other vessels subjected to pressure. C. WALLMANN and F. NEHL. Brit. 285,450, Feb. 17, 1927. Receptacles, conduits, etc., are made from ingot steel contg. up to about 0.3% Mo and may be hydraulically tested, heated to just above a max. crit. point and then cooled.

Separating metals welded or similarly attached together. EISEN- UND STAHLWERK W. PEYINGHAUS. Brit. 285,508, Feb. 18, 1927. Metals such as those formed in part of iron or steel and in part of attached brass or gunmetal are heated in a reducing or inert atm. to a temp. below the m. p. of the metals but at which the brass or like metal becomes brittle so that it may be broken away from the iron or steel by light hammer blows.

Solder. METALLBANK UND METALLURGISCHE GES. A.-G. Brit. 285,485, Feb. 18, 1927. A hard solder suitable for use with gray pig iron, cast steel and like metals comprises Cu 42–60, Ni 1–10, Si up to 3%, and the remainder Zn.

Aluminothermic soldering. FÉLIX LANGE. Fr. 635,389, June 1, 1927. The cavity of the soldering mold has two compartments in communication, one of which is filled with an aluminothermic mixt. which reacts, while a previously melted charge is poured into the second contg. the joint to be soldered.

10—ORGANIC CHEMISTRY

CHAS. A. ROUILLER AND CLARENCE J. WEST

Hypothesis of valency-deflection. CHRISTOPHER K. INGOLD AND JOCELYN F. THORPE. *J. Chem. Soc.* **1928**, 1318–21.—Polemical with Hückel (*C. A.* **22**, 1141). C. J. WEST

Crystals of a new organic compound. J. J. P. VALETON. *Z. Krist.* **66**, 516(1928).—Crystals of *3-methyl-5-methylaminohydantoylmethylamide*, NH.CO.NMe.CO.C(NHMe)-CONHMe, are clear and colorless, with m. p. 187°. They are triclinic, with $a:b:c$ = 1.2493:1:1.0012, and $\alpha = 90°38'$, $\beta = 93°52'$ and $\gamma = 107°39'$. L. S. RAMSDELL

Rapid methods of obtaining pure methane and ethane. W. M. KEMULA. Jan. Kazimir Univ. *Przemysl Chem.* **12**, 411–2(1928).—CH_4 prepd. by L. Moser's method (*Die Reindarstellung von Gasen.* **1920**, 128; *C. A.* **15**, 1651) is passed through a glass tube 80 cm. long and 2 cm. diam., which is packed with CuO for $^3/_4$ of its length and with reduced Cu screen through the remainder of the tube. This is heated to 360° in an elec. furnace. Gas flowing at 2 l. per hr. is passed through 1:3 KOH soln. C_2H_6 prepd. also according to Moser's method (*l. c.* page 133) is similarly treated, except that it is heated only to 280°. Gases so treated are practically 100% pure. A. C. ZACHLIN

The action of the alkyl chlorides in the Würtz reaction. HARRY F. LEWIS. *Proc. Iowa Acad. Sci.* **34**, 222(1927).—At the last meeting of the Iowa Acad. a report was made on the mechanism of the Würtz reaction with Bu and iso-Bu bromides. The

prepn. of octane in this manner is costly and an attempt has been made to replace the bromide by the chloride. Either in the presence or absence of ether as a solvent, the reaction is difficult to control. Yields of octane up to 20% based on the Bu chloride have been obtained. An extremely inflammable by-product is produced and it is difficult to complete a prepn. without at least one fire. With octane itself as a solvent, several bad explosions resulted. W. G. GAESSLER

Physico-chemical and thermodynamic investigations on hydrocarbons. M. AUBERT AND J. VILLEY. *Chimie et industrie* Special No., 258–61(April, 1928); cf. *C. A.* **21**, 645.—The investigation previously outlined, which is of very wide scope, has been started, and the results obtained to date by a no. of co-workers are briefly discussed (cf. following abstracts). A. PAPINEAU-COUTURE

Analysis of mixtures of hydrocarbons by means of their refractive dispersion. R. MOUTTE. *Chimie et industrie* Special No., 262–3(April, 1928); cf. Dixmier, *C. A.* **21**, 645.—Using the Pulfrich refractometer and the Féry disperso-refractometer (Chéneveau and Vaurabourg, *C. A.* **22**, 3553) M. obtained the following values for $\Delta n/d \times 10^4$ (n for $\lambda_1 = 0.589\mu$ and for $\lambda_2 = 0.436\mu$): octane 118, nonane 116.6, decane 115.6, undecane 117, duodecane 119, tetradecane 114.6, octene 145.7, nonene 133.9, decene 136, duodecene 132.9, tetradecene 129.8, hexadecene 126, undecadiene 150, cyclohexene 141, 4-methylcyclohexene 142, 3-methylcyclohexene 142, 2-methylcyclohexene 148, PhEt 224, styrolene 340. With an Abbé refractometer, for $\lambda_1 = 0.486\mu$ and $\lambda_2 = 0.656\mu$, the following values were obtained: hexane 104.4, heptane 101.4, decane (di-isoamyl) 101.9, cyclohexane 99, C_6H_6 189.7, PhMe 186.3, comm. xylene 179.4, cyclohexene 114.5. Though the values for different hydrocarbons of a given series show some variation, in using them for the analysis of mixts. of hydrocarbons of different series, the values selected should preferably be those of the hydrocarbon having approx. the same b. p. as the fraction being analyzed. This method for the detn. of aromatic hydrocarbons in aviation gasoline free from C_2H_4 hydrocarbons always gave results agreeing closely with those obtained from detn. of the critical soln. temp. in $PhNH_2$. A. PAPINEAU-COUTURE

Identification of hydrocarbons by means of their magnetic rotatory power. A. JAVELLE. *Chimie et industrie* Special No., 264–6(April, 1928); cf. Jacob, *C. A.* **21**, 645.—Using the method and app. previously described by Jacob, which Javelle studied and to which he made certain refinements, and taking Verdet's figures of $k = 1.53 \times 10^{-2}$ for H_2O at 20.2° and $k_1 = 3.38 \times 10^{-2}$ for C_6H_6 at 20.8°, J. obtained the following values for k at $\lambda = 0.546\ \mu$: hexane (18.3°) 1.46, heptane (21.4°) 1.51, octane (20.6°) 1.52, C_6H_6 (20.8°) 3.38, PhMe (20.3°) 3.08, PhEt (20.8°) 3.03, cyclohexane (20.1°) 1.47, dimethylcyclohexane (18.3°) 1.58, cyclohexene (20.6°) 1.747, 2-methylcyclohexene (18.25°) 1.71, 4-methylcyclohexene (18.5°) 1.75, 3-methylcyclohexene (18.4°) 1.753. A study of the variation of the value of k for mixts. of cyclohexane and PhMe, cyclohexane and C_6H_6, and cyclohexene and PhMe showed that k is a linear function of the compn., in accordance with Biot's law of additivity. The possible error in the detns. carried out on these mixts. was less than 0.25%. A. P.-C.

Investigation of the specific inductive power of hydrocarbons. R. TOUSSAINT. *Chimie et industrie* Special No., 270–4(April, 1928).—With a view to the possible application of the detn. of sp. inductive power to the identification and analysis of hydrocarbons, a method has been devised based on the electrometric detn. of the capacity of a given condenser with air as a dielec. and then with the liquid under investigation as dielec. The requirements of such a method and of the app. used in carrying it out are discussed, and the app. adopted is described. The limit of accuracy obtainable is of the order of 0.005. The following values (at 23°) were obtained: C_6H_6 2.275, heptane 1.978, hexane 1.884, cyclohexane 2.026. A study of the variation of the sp. inductive power of mixts. of hydrocarbons as a function of their compn., which was carried out on hexane-C_6H_6 and pentane-C_6H_6 mixts., showed that this variation is not a linear function. A. PAPINEAU-COUTURE

The hydrogenation of organic compounds. E. J. LUSH. *Notiz. chim.-ind.* **3**, 489–95(1928).—A review, with 22 references. C. C. DAVIS

The succinic derivative of triaminophenol. MARIO COVELLO. *Atti II congresso naz. chim. pura applicata* **1926**, 1343.—2,4,6-$(H_2N)_3C_6H_2OH$ fused with $\underbrace{CH_2.CO.O.CO.CH_2}$ (3 mols.) at 200° gives quant. the *trisuccinic deriv. of 2,4,6-triaminophenol*, 2,4,6-$(\underbrace{CO.CH_2.CH_2.CO.N}){}_3C_6H_2OH$, easily oxidized by HNO_3 (d. 1.43) to *2,6-bis(succinylamino) quinone*. Reduced with SO_2 this gives the *hydroquinone*, pale yellow. C. C. DAVIS

Thermal decomposition of gaseous hydrocarbons. S. MANTEL. Chem. Research Institute, Warsaw. *Przemysl Chem.* **12**, 333-42(1928).—Preheated natural gas, 97%, was passed through a furnace and the products were measured at the end of reactions under various conditions. Slower rate and larger catalyst surface cause greater percentage decompn. H_2 with 0.7% CH_4 impurity was obtained. No higher purity was attained up to 1700°. Periodical and patent literature on the subject is reviewed and a bibliography is given. A. C. ZACHLIN

The action of the silent electrical discharge on the hydrocarbons of the ethylene series. D. N. PRYANISHNIKOV. Landwirtschaftl. Timirjasevschen Akad., Moskau. *Ber.* **61B**, 1358-63(1928); cf. Demjanov and P., *C. A.* **21**, 3344.—In this paper, which is a continuation of the work on the action of the silent elec. discharge on C_2H_4, MeCH:CH_2, $Me_2C\cdot CH_2$ (I) and $(MeCH\cdot)_2$, are reported the results of a more thorough study of the liquid polymerization product obtained from I. It shows d_4^{20} 0.831, n_D^{20} 1.4483, av. mol. wt. 202, C 85.46%, H 14.60%, I no. (Wijs) 156; 30% b_{740} up to 150°. The light fractions contain more H than corresponds to the formula C_nH_{2n}, *i. e.*, the polymerization is accompanied by a distribution of the H. The satd. hydrocarbons resulting from this distribution, which are more stable and have a lesser tendency to further transformations, are found in the lighter fractions, while the unsatd. compds., which polymerize more rapidly, serve for the production of non-volatile, resinous products of high mol. wt. The polymerization is also accompanied by the splitting off and addn. of hydrocarbon radicals, which explains the formation of fractions b 32-52° and 75-85° and having mol. wts. corresponding to compds. of the C_6 and C_7 series. The compn. of these fractions indicates that they contain 20-30% of C_nH_{2n} and 70-80% of C_nH_{2n+2} compds. and the addn. of Br and decolorization of $KMnO_4$ points to the presence of compds. with double bonds. Polymethylenes, which have a much higher b. p., can be present in only very small quantities. The 32-52° fraction most probably contains $(Me_2CH)_2$ and $(Me_2C\cdot)_2$, the 75-85° fraction $CH_2(CHMe_2)_2$, $PrCMe_3$, Me_2CHCMe_3 and the corresponding pentenes. The higher fractions are considerably richer in unsatd. hydrocarbons and also contain naphthenes. After treatment with CrO_3-H_2SO_4 their compn. corresponds to 60% C_nH_{2n} and 40% C_nH_{2n+2}. The presence of naphthenes is also indicated by the lack of additive power. Since oxidation with CrO_3-H_2SO_4 gives AcOH and a little HCO_2H (as well as acids with a higher mol. wt.) it is probable that among the compds. with double bonds in the original fractions (before treatment with CrO_3-H_2SO_4) are present the ordinary polymerization products of I contg. the Me_2C: grouping. No attempts were made to prove the presence of aromatic compds., but the consts. of the products indicate that no appreciable quantities are present. The character of the products depends greatly on the conditions, especially on the length of the expt., every prolongation increases the yield of highly polymerized, non-volatile products. Increase in the voltage, on the other hand, seems not to influence the character of the products to the same degree but essentially only to accelerate the polymerization; the yield increased several-fold on raising the voltage from 12,000 to 20,000-25,000. The structure of the original hydrocarbon has a great influence on the velocity of the reaction; cyclopropane is apparently polymerized only half as rapidly as $MeCH\cdot CH_2$ under the same conditions. The elec. energy consumed could not be detd. for lack of a wattmeter, but is probably not very great. The resinous products formed can be converted into volatile hydrocarbons by the cracking process. C. A. R.

A new class of compounds with tervalent carbon. STEFAN GOLDSCHMIDT WITH ALFRED SADLER, ERICH GELBER, HERBERT SCHÜSSLER AND ADOLF VOGT. *Ber.* **61B**, 829-38(1928).—The analogy between C_2H_6 and N_2H_4 finds expression, beyond merely formal lines, especially in the aromatic substitution products of the 2 substances. The dissocn. of $(CPh_3)_2$ into CPh_3 corresponds to that of $(NPh_2)_2$ into Ph_2N. Analogous to Ph_2NNPh is the monomol. Ph_3CCPh_2. Qual., the 2 series differ in the generally lesser dissocn. of the N as compared with the corresponding C derivs. The $\alpha,\alpha,\alpha',\alpha'$-tetraphenyl-$\beta,\beta'$-diacyltetrazanes (*C. A.* **16**, 2852) are characterized by their extensive dissocn. into the corresponding hydrazyls and it therefore seemed that it should be possible to synthesize the analogous C radicals, Ph_3CCBz_2, from the corresponding ethanes (as yet unknown). All attempts to prep. the latter by treating, *e. g.* Bz_3CMe with $BrCHPh_2$, Ph_3CMe with $BrCHBz_2$ or Ph_3CCl with $MeCHBz_2$, failed, however. Better results were obtained by condensing Ph_3CCl and CH_2Bz_2 with $NaNH_2$; this yielded a small quantity of a compd. which after much purification proved to be a hydrocarbon (I) of the expected compn. The chief products of the reaction, however, were Ph_3CNH_2 and $(Ph_3C)_2O_2$, together with a large quantity of uninviting tars. With K as the condensing agent, the I was finally obtained in about 30% yield by carrying

out the reaction in very concd. C_6H_6 soln. and scrupulously excluding moisture and O; along with the I were formed much tar and more or less considerable quantities of Ph_3CH. During the reaction there develops a deep red color which, however, finally disappears again. The compn. and mol. wt. of the I correspond to the formula Ph_3CCHBz_2 but on vigorous treatment with Br it gives a *di-Br deriv.*, $C_{34}H_{24}O_2Br_2$ (II), which holds both Br atoms very loosely; boiling MeOH splits them off (with differing velocity) as HBr through an intermediate *bromocarbinol*, $C_{34}H_{24}O_2Br(OH)$ (III), which was isolated. Again, on boiling several hrs. in AcOH with CrO_3, I yields, not Ph_3COH + BzOH, but p-$BzC_6H_4CO_2H$ + BzOH. I can therefore be only *ω,ω-diphenyl-ω′,ω′-dibenzoyl-p-xylene*; possibly Ph_3CCHBz_2 is first formed and rearranges into I by migration of the $CHBz_2$ group. Oxidation of II likewise yields only BzOH and $BzC_6H_4CO_2H$ and no brominated product; this and the ease with which it is hydrolyzed (by boiling MeOH, as stated above, and also by concd. H_2SO_4, in which it dissolves with deep brown-red color) indicate that both Br atoms are in tertiary aliphatic combination, $Ph_2CBrC_6H_4CBrBz_2$. Since $Ph_2CBrC_6H_4CBrPh_2$ with metals gives the quinomethane $Ph_2C{:}C_6H_4{:}CPh_2$, II might have been expected to react in the same way but as a matter of fact it does not. With Cu or Ag, it loses only one Br atom with formation of deep brown-red solns. of a *methyl* (IV), which could not be obtained in cryst form. In soln. it is entirely free of the dimer, as shown by mol. wt. detns. and by application of Beers' law; towards O it is exceedingly unreactive, undergoing no appreciable alteration after several days; it does not react with other radicals (NO, Ph_3C, Ph_2N, diphenyltrinitrophenylhydrazyl); it is sensitive only towards NO_2 (with which it forms no cryst. products, however), halogens and the halogen acids; with Br, *e. g.*, it regenerates II, taking up 1 atom Br. Among the metals, Zn occupies an exceptional position in its reaction with II; in the form of Zn dust it gives, not a quinomethane ether, but halogen-free products (probably formed through IV), *viz.* $Ph_2CHC_6H_4CHBz_2$, and a compd. (V), contg. 2 atoms more of O and characterized by its slight soly.; V is very probably a *peroxide carbinol*, $(HOC_{34}H_{24})_2O_2$. Of the 2 possible structures, $Ph_2CC_6H_4CBrBz_2$ and $Ph_2CBrCBz_2$, for IV, the 2nd is probably the correct one, for the 1st represents a deriv. of Ph_3C and such a substance would be expected to have the properties of a Ph_3C compd., especially the sensitivity to O, while the 2nd formula represents a ketomethyl (hitherto known only in cyclic compds. as the tautomers of aroxyls, in which the sensitivity to O can be greatly diminished). I, m. 165–6°, sol. in concd. H_2SO_4 almost without color, mol. wt in freezing C_6H_6 431; its boiling alc. soln. is colored a characteristic deep yellow by NaOH. *ω,ω-Diphenyl-ω′,ω′-dibenzoyl-p-xylene dibromide* (II), m. 171–3°, mol. wt in C_6H_6 622. V, m. 195–6°. III, m. 181°, dissolves in concd. H_2SO_4 with deep yellow-red color, is unchanged by long boiling in C_6H_6 with metals (Cu, Ag powder, Zn dust). The red solns. of IV are decolorized by NO_2 and the color is not restored by heating. C. A. R.

Nitrogen trichloride and unsaturated hydrocarbons. II. GEORGE H. COLEMAN, G. M. MULLINS AND ELIZABETH PICKERING. State Univ. of Iowa. *J. Am. Chem. Soc.* **50,** 2739–41(1928); cf. *C. A.* **18,** 1812.—The reaction products of NCl_3 with $CH_2{:}CH_2$ are N, NH_4Cl, CH_2ClCH_2Cl and $CH_2ClCH_2NCl_2$, converted by HCl to $CH_2ClCH_2NH_2$ (13.7% yield); Bz deriv., m. 104–5°. $CH_2{:}CH_2$ requires about 2 weeks at 20–5° for the completion of the reaction. $MeCH{:}CH_2$ reacts similarly but more rapidly than $CH_2{:}CH_2$; of the 2 possible addn. products, only $MeCH(NCl_2)CH_2Cl$ was definitely shown to be formed; the yield of amine is 19.5%; the Bz deriv., m. 74–5°. $Me_2C{:}CH_2$ reacts in 2–3 hrs., even at −45° to −50°; in this reaction most of the $Me_2C(NH_2)CH_2Cl$ ppts. as the HCl salt along with the NH_4Cl; yield, 12.2%, Bz deriv., m. 83–4°. 2-Pentene and cyclohexene behave similarly; the yields of amine-HCl were 10–21 and 23%, resp.; the Bz derivs., m. 106–7° and 162–3°, resp. **III. Nitrogen trichloride and diphenyl ketene.** G. H. COLEMAN AND ARTHUR W. CAMPBELL. *Ibid* 2754–7.—$PhCH{:}CH_2$ (200 mols. in 400 g. CCl_4) and 71 mols. NCl_3 in 250 g. CCl_4 give 46.4 mg. atoms N, 3.2 mg. mols. NH_4Cl and 19.6 mg. mols. (27.6%) of the amine, $PhCH(NH_2)CH_2Cl$, whose Bz deriv. m. 133–4°. $PhCH{:}CHPh$ and NCl_3 give 70.5 mg. atoms N, 2.8 mg. mols. NH_4Cl and 16.8 mg. mols. of $PhCH(NH_2)CHPhCl$, whose Bz deriv. m. 192–3°. $Ph_2C{:}CH_2$, $Ph_2C.CHMe$, $Ph_2C{:}CHPh$ and $Ph_2C{:}CPh_2$ gave no amines under the exptl. conditions used. $Ph_2C{:}CO$ and NCl_3 give an addn. product, which, warmed with NaOH, gives $Ph_2C{:}NH$ (35%). C. J. WEST

Equilibrium in the reaction $C_2H_6 \rightleftharpoons C_2H_4 + H_2$. ROBERT N. PEASE AND ELFORD S. DURGAN. Princeton Univ. *J. Am. Chem. Soc.* **50,** 2715–8(1928).—The position of equil. in the reaction $C_2H_6 \rightleftharpoons C_2H_4 + H_2$ has been measured at 600°, 650° and 700°, equil. being approached from both sides. Some uncertainty exists because of the simultaneous formation of CH_4, but the indications are that the equil.

consts. at the 3 temps. are 0.0310, 0.082 and 0.20, resp., partial pressures being expressed in atms. The data are satisfactorily reproduced by the equation $\Delta F = -RT \ln K = 31{,}244 - 28.88\ T$. C. J. WEST

Catalytic hydrogenation of different types of unsaturated compounds. III. Hydrogenation of conjugated systems. SERGUEY V. LEBEDEV AND ANASTASIA O. YAKUBCHIK. Military Medical Acad., Leningrad. *J. Chem. Soc.* **1928**, 2190–204; cf. *C. A.* **22**, 2362.—Continuing the earlier work, the reduction of diisopropenyl, divinyl and piperylene has been studied. The hydrogenation of H_2C:CMeCMe:CH_2 proceeds at a similar rate to that of isoprene, 68–70% of the H necessary for satn. being absorbed at a uniform velocity; in the next stage the rate of absorption increases (22.5% H absorbed) and then falls abruptly in the 3rd and last section (8.5% H). The 2nd section corresponds to H_2C:CMeCHMe_2, the 3rd to Me_2C·CMe_2. The compn. of the reaction mixt. after 25, 50 and 69% hydrogenation is given and also the behavior of mixts. with standard ethylenic derivs. of different degrees of substitution. The original should be consulted for the details. All 3 compds. belong to the so-called Type II of conjugated systems. C. J. WEST

Relative rates of reaction of olefins in combustion with oxygen and in oxidation with aqueous potassium permanganate. H. S. DAVIS. *Ind. Eng. Chem.* **20**, 1055–7 (1928).—Known mixts. of C_2H_4 and propene and of C_2H_4 and isobutene were exploded with O and also oxidized in H_2O with $KMnO_4$. In every case it was found that propene or isobutene was oxidized faster than the C_2H_4. The reaction with Br was similar. In bromination of the olefins the main reaction is Br addn. to the unsatd. C atoms. In combustion there is good evidence that the primary reactions are the addn. of 1 or 2 atoms of O to the olefin. The rates of combustion and of bromination of olefins can both be increased by intensive drying. D. F. BROWN

Relative rates of bromination of the olefins. HAROLD S. DAVIS. Mass. Inst. Tech. *J. Am. Chem. Soc.* **50**, 2769–80(1928).—C_2H_4 brominates in CCl_4 at a rate measurable with time; if the solns. are dried and kept away from bright light, the reaction requires hrs. and even days for completion. The rate of the dark reaction of C_2H_4 with Br in CCl_4 varies greatly with the quantity of moisture in the soln.; the rate is increased over 5 times on the addn. of 5% by vol. of CCl_4 satd. with H_2O; O and HBr have no influence on the rate. Bright light enormously increases the rate of bromination of C_2H_4 in CCl_4 (shown by figure). The rate of the dark bromination increases progressively as the temp. is lowered from 25° to 0°, the ratio of K (25°/0°) varying from 1 20 to 1:130. It is suggested that the dark bromination of C_2H_4 in CCl_4 proceeds mainly through a Br hydrate and that the concn. of this hydrate increases as the temp. is lowered from 25° to 0°. The bromination of C_3H_6 is considerably faster at 0° than at 25°; however, temp. has little effect on the rate of bromination of Me_2-C:CHMe or diisobutene. Light increases the rates of bromination of the olefins but decreases the relative difference between them. The methods used for following the course of the bromination were color comparison with a standard Br soln. and titration of the Br. Care must be taken in the preservation of the dried Br-CCl_4 solns.
C. J. WEST

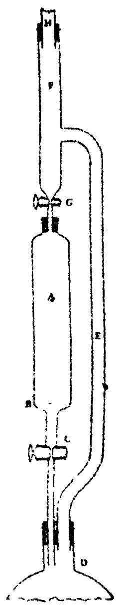
Relative rates of absorption of the gaseous butenes into sulfuric acid. HAROLD S. DAVIS. Mass. Inst. Tech. *J. Am. Chem. Soc.* **50**, 2780–2(1928).—Calcns. on the relative absorption of the 3 butenes into H_2SO_4 have been made from the exptl. data of Michael and Brunel (*C. A.* **3**, 1165). With 1-butene as 1,2-butene is 2 and isobutene is 280–390. C. J. WEST

Reaction between acetylene and sulfur at temperatures up to 650°. JOHN B. PEEL AND PERCY L. ROBINSON. Armstrong College, Newcastle-on-Tyne. *J. Chem. Soc.* **1928**, 2068–70; cf. Briscoe and Peel, *C. A.* **22**, 3657.—In the reaction between S and C_2H_2, the liquid condensed at lab. temp. contains CS_2(I), thiophene(II) and thiophthene (III). At about 325°, 38% of the S was converted into a brown oil, contg. 77% I, 9% II and 6% III; at 500°, 74% of the S was converted into a brown oil, contg. 77% I, 12% II and 6% III; at 650°, 77% of the S was converted into a product contg. 83% I, 5% II and 3% III. The remaining S probably converts the C_2H_2 into C and H_2S. II has d_4^{20} 1.0615, γ_{20} 32.58; these data give a mol. parachor of 189.0 and the parachor of S as 46.5. C. J. WEST

Method of separation of zinc formaldehydesulfoxylate and zinc formaldehyde bisulfite. CH. SUNDER AND A. KEMPF. *Bull. soc. ind. Mulhouse* **94**, 473–4(1928).—Sealed Note 2223 of Feb. 20, 1913.—Heating Zn formaldehydebisulfite with Zn powder gives an insol. basic salt of Zn formaldehydesulfoxylate. The same basic salt can be obtained by the action of ZnO on Zn formaldehydesulfoxylate, but not on Zn formaldehydebisulfite. This allows of practically quant. sepn. of the two by treating a soln.

contg. them both with ZnO at 45–50° for 1 hr. Report. R. FLATT. *Ibid* 474–6.—The results of S. and K. were confirmed, but the sepn. was not quant., probably because the ZnO used by F. may not have been as active as the one used by S. and K., and longer time should have been allowed for the reaction. A. PAPINEAU-COUTURE

A modification of Adam's method of preparing alkyl iodides. H. S. KING. Dalhousie Univ., Halifax, N. S. *Proc. Trans. Nova Scotian Inst. Sci.* **16,** 87–91 (1928).—The app. proposed by Adams and Voorhees (*C. A.* **13,** 2032) has been simplified as shown by the fig. *A* is a cylindrical separatory funnel capable of holding 2 kg. of loose I crystals; *B* is a perforated Pt plate, to prevent clogging of the stopcock; *C* is 5 mm. in bore, *G* 3 mm. in bore; *E* 25 mm. in diam.; *F* 40 mm. in diam.; *H* is a condenser. The lower tube of *G* is flush with the stopper so that the condensate will run along the sides of *A*. A. L. HENNE



Synthetic methanol. F. VALETTE. *Chimie & industrie* **Special No.,** 235–8 (April, 1928).—A theoretical discussion of the possibilities of the synthesis of MeOH from CO and H_2, from which V. concludes that the experience gained in the synthesis of NH_3 would enable the production of MeOH independently of the manuf. of synthetic NH_3 to be readily established, that the cost would be approx. 1.18 francs per l., that the cost of MeOH equiv. to 1 l. of gasoline would be about 1.77 francs, and that it would be feasible to produce enough MeOH to replace the whole of the gasoline now being imported into France. A. P.-C.

A study of the synthesis of methanol. ÉTIENNE AUDIBERT AND ANDRÉ RAINEAU. *Ind. Eng. Chem.* **20,** 1105–10 (1928).—The effect of a large no. of metals and metallic oxides in catalyzing the synthesis of MeOH from CO and H_2 under high pressure has been studied. Reduced Cu and ZnO were the most effective. The method of prepn. of the catalyst is very important, and it is essential that the reduction be carried out at a low temp. Mixed catalysts were superior to single-component catalysts. T. S. CARSWELL

Comparative study of values obtained in synthesis of methanol. A. C. FIELDNER AND R. L. BROWN. *Ind. Eng. Chem.* **20,** 1110–2 (1928).—Values for the equil. const. in the Nernst equation have been calcd. for the reaction: $CO + H_2 = MeOH + Q$ calories, with the experimental data which have been reported by different independent observers. In spite of probable variation in the exact conditions of the expts from different labs., there is a close agreement in the values of the const. T. S. C.

Condensation of phenylenediamines with acetanilide. Salts of tolylphenylethenylamidines. H. BECKER. *Roczniki Chem.* **8,** 242–9 (1928); cf. *C. A.* **20,** 1799.—*Diphenylethenylamidine* (I) was prepd. in 98% yield by the condensation of acetanilide (II) with aniline in the presence of $POCl_3$, m. 132.5°. I.*HCl*, m. 218° (decompn.). I.*HBr*, m. 200° (decompn.). *m-Phenylenebis(phenylethenylamidine)*, *1,3-C_6H_4(N:C-(CH_3).NH.C_6H_5)$_2$* (III), m. 212.5–3°, was obtained by heating 4 hrs. on the water bath 5.4 g. II with 4.2 g. $C_6H_4(NH_2)_2.H_2SO_4$ in 50 cc. benzene with 4 cc. $POCl_3$. Yield 60%. Easily sol. in hot MeOH, EtOH and acetone, it crystallizes on diln. Moderately sol. in $CHCl_3$, slightly in benzene, CCl_4 and ether. III.*2HCl*, m. 275° (decompn.), is prepd. by dissolving 1.4 g. III in 10 cc. 10% HCl, evapn. on the water bath and drying in the vacuum desiccator, easily sol. in water, EtOH, MeOH, less in other org. solvents. The *condensation product* of II with o-$C_6H_4(NH_2)_2$ is impure. *Tolylphenylethenylamidines* (IV), *o*-, m. 141.5°, *m*-, m. 98.5°, and *p*-, m. 90°, are prepd. by the same method. *o*-IV.*HCl*, prisms from benzene, m. 154–6°. *m*-IV.*HBr* from benzene-petroleum ether, m. 152° (decompn.). *p*-IV.*HCl* from xylene, m. 194° (decompn.), is faintly yellow. The amidines are tasteless. The salts are bitter, sol. in water, MeOH, EtOH, acetone, $CHCl_3$, moderately sol. in hot benzene and ligroin, scarcely in other org. solvents. Both amidines and salts show multicolored luminescence in polarized light. Alkaloidal reagents, with the exception of tannin, produce ppts. in the aq. salt solns.; phosphomolybdic acid, yellow; I-KI, brown; $KBiI_4$, brick-red; $KHgI_3$, greenish or yellowish; $HAuCl_4$, yellow (HCl), or brick-red (HBr). H_2PtCl_6 gives a ppt. only with III.*2HCl*. MARY JACOBSEN

***O, N, N*-Trialkylhydroxylamines.** LAUDER W. JONES AND RANDOLPH T. MAJOR. Princeton Univ. *J. Am. Chem. Soc.* **50,** 2742–7 (1928).—MeONHMe and MeI in dry Et_2O, allowed to stand 4 days, give a ppt., m. 134° ($MeONH_2MeI$); the Et_2O filtrate was treated with a little K_2CO_3 to combine with HI and with PhCNO to remove MeONHMe; distn. gives a mixt. of Et_2O and *O,N,N-trimethylhydroxylamine* (I), pptd.

as the *HCl salt*, m. 123° (46% yield); *chloroplatinate*, orange, m. 159° (decompn.); *free* **I**, from the HCl salt and concd. KOH, b. 30°; it has a fishy odor, does not reduce NHOH-$AgNO_3$ and shows no tendency to rearrange to Me_3NO. Heating **I** with concd. HCl gives $CHCl_3$, $MeNH_2$ and HCHO, the intermediate product probably being Me_2-NOH, which gives MeN:CH_2 and H_2O and finally HCHO and $MeNH_2$; the possibility that the initial reaction is the formation of Me_2NH and HCHO is excluded by the fact that at 190° Me_2NH is not decompd. by concd. HCl. *O,N-Diethyl-N-methylhydroxylamine*, prepd. in a similar manner in 20% yield, b. 79°; *chloroplatinate*, orange, m. 158°. EtI reacts with EtONHEt very slowly. Me_2CHOH and EtONHEt.HCl give $EtNH_2$.HCl, Me_2CO and EtOH. I and MeI give Me_3NOMeI, identical with that obtained from Me_3NO and MeI. C. J. West

Condensation products from acid amides and aldehydes. Constitution of the transformation products of the benzometoxazones. Erhard Glaser and Siegmund Frisch. *Arch. Pharm.* **266**, 103–16(1928).—The present study is an amplification of the investigation of nitro compds., as carried out by Glaser and others (cf. *C. A.* **20**, 2487). Simple melting together at about 100° of *m*-nitrobenzaldehyde and salicylamide yielded *2-m-nitrophenylbenzometoxazone* (I), $C_{14}H_{10}O_4N_2$, m 220° (*N-acetyl* deriv., m 116°, the *N-benzoyl, deriv.* m. 173°). This condensation is also smoothly effected in alc. soln. in the presence of a little HCl. On treating I with 50% KOH in C_5H_5N, followed by strong diln. in an excess of HCl, a phenolic polymer, m. 175°, may be sepd. Its differentiation from the cyclic form is readily effected by soln in ammoniacal alc Titherly's hypothesis that syn - and antiforms of the phenolic type exist is without foundation. The phenolic form is not a true tautomeric modification, but rather a dimeride, $C_{28}H_{20}O_8N_4$, susceptible of easy dissocn. Its *O-acetate* m. 187–8° (decompn.), the *O-benzoate* m. 161°. Attempts to methylate I with Me_2SO_4 lead to its conversion into the phenolic dimeride. It is unaffected by CrO_3 in AcOH, but yields with Br in AcOH dibromosalicylamide. Condensation of *m* nitrobenzaldehyde and benzamide was effected in alc soln. (in the presence of dil HCl) to *m-nitrobenzalbisbenzamide*, m. 224°. Similarly, the following were prepd · *o-nitrobenzalbisbenzamide*, m. 217–8°; *m-nitrobenzalbisacetamide*, m. 236–7; *o-nitrobenzalbisacetamide*, 231–2°, *m-nitrobenzalbisurethan*, m. 192 3°; *o-nitrobenzalbisurethan*, m. 179°. W. O E.

β-Phenylalanine derivatives. V. M. Rodionov and A. M. Fedorova. Tech. High School, Moscow. *Arch. Pharm.* **266**, 116–21(1928).—In continuing their studies on the β-phenylalanine derivs. the following methoxy compds. have been prepd. and characterized. Vanillin and protocatechualdehyde both are converted into veratraldehyde, on treatment with phenyltrimethylammonium hydroxide soln , in yields of 86 and 58.3%, resp. Similarly, 2,4-dimethoxybenzaldehyde was prepd. from resorcylaldehyde (yield 41.7%), and *o*-, *m*- and *p*-methoxybenzaldehydes from salicylaldehyde, *m*-hydroxy- and *p*-hydroxybenzaldehydes, resp. (yields 72 8, 88 and 66 6%, resp.). Veratraldehyde, malonic acid and abs. alc. NH_3 yield *β-amino-β-3,4-dimethoxyphenylpropionic acid* (*HCl salt*, $C_{11}H_{15}O_4N$.HCl, m. 207 8°, yield 59%). Similarly, β-amino-β-2,4-dimethoxyphenylpropionic acid was obtained in poor yield from 2,4-dimethoxybenzaldehyde, likewise the 3 monomethoxy analogs. In each case the corresponding methoxycinnamic acid appeared as by-product. *β-Amino-β-o-anisylpropionic acid* (*HCl salt*, m. 208–10°; yield 33%). *β-Amino-β-m-anisylpropionic acid* (*HCl salt*, m. 190°; yield 39%). *β-Amino-β-p-anisylpropionic acid* (*HCl salt*, m. 205°, decompn.; yield 59%). W. O. E.

Dibutyl ether as a solvent for the Grignard reagent. C. S. Marvel, A. T. Blomquist and L. E. Vaughn. Univ. of Ill. *J. Am. Chem Soc.* **50**, 2810–2(1928).—The yields of the Grignard reagent from several typical halogen compds. when Bu_2O is the solvent are nearly equal to those obtained in Et_2O MeEtCHCO$_2$H is obtained in 66% yields, $C_9H_{19}OH$ in 65% yields and cyclohexylcarbinol in 61–5% yields In many reactions it has a decided advantage over Et_2O. C. J. West

Some ethers of the cyclohexanediols. L. Palfray and S. Sabetay. Houbigant Lab., Puteaux, Seine. *Bull. soc. chim.* **43**, 895–900(1928).—Thirty-five g. dry 1,2-cyclohexanediol (pyrocatechitol) (I), m. 74°, probably a *cis-trans* mixt., was dissolved in 200 g. MeI, heated on a water bath and 150 g. freshly prepd. and dried Ag_2O added in small portions. After being heated for 9 hrs., the material was dried, washed with MeOH and distd. The 2 ethers were sepd. by repeated fractionation, though because of the proximity of their b. ps., each contained a small amt. of the other. *Mono-Me ether* of **I**, b_{15} 74–6°, n_D^{18} 1.4572, d_{18} 1.001 (cf. *C. A.* **8**, 3186; **21**, 572). *Di-Me ether* of **I**, mint-like odor, burning taste, b_{15} 65–6°, n_D^{18} 1.4460, d_{18} 0.9652. *Bis(chloromethyl) ether* of **I**, prepd. by method of Henry, b_{16} 136–7°, n_D^{21} 1.4880. In C_6H_6 soln. it reacted

vigorously with Na when heated. The product consisted of a liquid fraction (b_{15} 62–5°, n^{18}_{D} 1.4555) and a solid fraction which decompd. when distd. These are to be studied later. In the methylation of 1,3-cyclohexanediol (resorcitol) (II), a little abs. MeOH was added because of the insoly. of II in MeI. The fraction corresponding to the *di-Me ether* of II had a $CHCl_3$-like odor, a burnt-sugar taste, b_{15} 65–6°, n^{17}_{D} 1.4985, d_{17} 1.395. The fraction corresponding to the *mono-Me ether* of II had a faint aromatic odor, b_{15} 97–8°, n^{17}_{D} 1.4650. *Bis(chloromethyl) ether* of II b_{14} 144–5°, n^{17}_{D} 1.4922. From this and an excess of MeMgI was obtained the *di-Et ether* of II, burning taste, b_{15} 85–6°, n^{18}_{D} 1.4400, d_{18} 0.9127. 1,4-Cyclohexanediol (quinitol) (III) has a *cis*-form (IV), m. 101–2° and a *trans*-form (V), m. 139–40°. Methylation of III with MeI and Ag_2O, by using abs. MeOH to dissolve III, gave the *mono-Me ether* of IV, bitter taste, b_{15} 102–3°, n^{19}_{D} 1.4671, d_{19} 1.023; the *di-Me ether* of IV, strong odor, burning taste, b_{14} 67.5–8°, n^{18}_{D} 1.4440, d_{18} 0.9526; the *mono-Me ether* of V, b_{15} 102.5–3°, n^{20}_{D} 1.4649, d_{19} 1.021; the *di-Me ether* of V, b_{15} 68–9°, n^{18}_{D} 1.4430. The *bis(chloromethyl) ether* of III, b_{14} 148–9°, n^{21}_{D} (for superfused liquid) 1.4936, by reaction with iso-PrMgBr gave the *diiso-Bu ether* of III, b_{13} 122–4°, n^{19}_{D} 1.4410, d_{19} 0.8833. LOUISE KELLEY

Preparation of ethylenic ethers by cyclization of bis(chloromethyl) ethers. S. SABETAY AND G. SANDULESCO. Houbigant Lab., Puteaux, Seine. *Bull. soc. chim.* **43**, 904–6(1928).—To 3 mols pulverized Na in suspension in C_6H_6 was added drop by drop 33 g. of the bis(chloromethyl) ether of 1,2-cyclohexanediol (I). The C_6H_6 began to boil at once. After 2 hrs. the C_6H_6 layer was free from Cl. After removal of C_6H_6 and distn., there was obtained 7 g. of the ethylenic ether of I, having a mint-like odor, a burning taste, b_{20} 65.5–6.5°, n^{18}_{D} 1.4585, d_{18} 1.035. S. and S. give an easy method for the prepn. of the methylenic ether of homopyrocatechol by heating the semicarbazone of piperonal with EtONa in an autoclave for 7 hrs. (cf. *C. A.* **7**, 790), b_{14} 80–1°, n^{13}_{D} 1.5330. LOUISE KELLEY

Ether of isosafrole bromohydrin. C. MANNICH AND FRIDA SCHMITT. *Arch. Pharm.* **266**, 84–6(1928).—The by-product appearing in the prepn. of isosafrole bromohydrin by the interaction of its dibromide and AcMe (cf. Mannich, *C. A.* **4**, 1044) is *bis[α-3,4-methylenedioxyphenyl-β-bromopropyl] ether*, $C_{20}H_{20}O_5Br_2$, m. 134°, and formed apparently by the action of unchanged dibromide on the bromohydrin. The compd. is quite stable, remaining unaffected by Pd and H, or org. bases. Hot alc. KOH, however, attacks the Br, yielding apparently a diethylenic ether in the form of a viscous oil, the latter being converted by HCl into 3,4-methylenedioxyphenyl ethyl ketone. An AcOH soln. of $AgNO_3$ likewise eliminates the Br with formation of a diacetate, which on distn. is resolved into AcOH and isosafrole oxide. HBr in AcOH converts the ether into isosafrole bromohydrin. W. O. E.

Stearic aldehyde. R. FEULGEN AND M. BEHRENS. Univ. Giessen. *Z. physiol. Chem.* **177**, 221–30(1928).—The aldehydes of higher fatty acids prepd. by Krafft (*Ber.* **13**, 1413) by dry distn. of the Ca salts of fatty acids with Ca formate are shown to be polymers incapable of forming functional derivs. or of reacting with fuchsin-SO_2. The simple aldehydes may, however, be obtained by reduction of the acid chlorides in xylene at 150° in the presence of Pd catalyst with a current of H. Completion of the reaction is detd. by collecting the HCl in *N* NaOH and titrating. The product when distd. at 1 mm. solidifies in the receiver. *Stearic aldehyde*, m. 55° (Krafft's polymer, m. 63.5°); *thiosemicarbazone*, m. 111° with previous sintering. *Palmitic aldehyde thiosemicarbazone*, m. 109°. The polymeric aldehyde has the mol. wt. of a dimer and may be depolymerized by vacuum distn. A. W. DOX

Pyrogenic decomposition of mixed magnesium carbonates. Preparation of ketones. D. IVANOV. *Bull. soc. chim.* **43**, 441–7(1928).—The carbonated Mg compds. obtained by the action of CO_2 on Mg aralkyl or *n*-primary alkyl compds. at −20° (cf. *C. A.* **19**, 1694) after removal of the ether by distn. afford (1) the hydrocarbon resulting from the decompn. 2RX + Mg = R·R + MgX_2 with (2) the ketone from the secondary decompn. RCO_2MgX + RMgX = RCO·R·MgX_2 + MgO; and (3), mainly, the ketone resulting from the decompn. $2RCO_2MgX$ = RCOR + MgX_2 + $MgCO_3$, the commencement of the 3rd stage being usually marked by the liberation of CO_2. With Mg *sec* alkyl or aryl or hydroaryl compds., the yields of ketone are poor and the decompn. affords mainly the corresponding ethylenic hydrocarbon, water, CO and CO_2. In the case of the carbonated Mg aryl compds., the corresponding hydrocarbon is the chief product, and dry distn. of the corresponding Ca or Ba salts affords the same products. Since decompn. of the corresponding Mg salts at similar

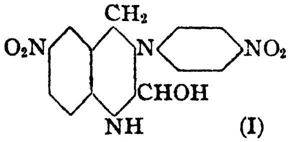
temps. affords practically the same yield of ketone, the mixed Mg carbonates are regarded as true salts of Mg and probably possess the sym. structure suggested by Jolibois (*C. A.* **6**, 2741) at high as well as at low temps. (cf. *C. A.* **21**, 3893), and the decompn. is to be represented: $(RCO_2)_2Mg.MgX_2 = RCOR + MgX_2 + MgO + CO_2$. The stability of the carbonated compd. is also dependent on the nature of the halide, the temp. of decompn. being lowest with the iodides and highest with the chlorides. The reaction is, however, best effected with the chlorides or bromides, these affording cryst. carbonates, whereas those derived from *sec.*-bromides or iodides are oily products. The following ketones have been prepd. in this way, the yields and temp. of decompn. being indicated: acetone, 330–60°, 57% (59% from $Mg(OAc)_2$); Et_2CO, 340–60°, 70% (74% from the propionate); Pr_2CO, 330–40°, 70%; Bu_2CO, 360–80°, 63% (from the chloride), 50% from the bromide at 330–40°; $(iso\text{-}Am)_2CO$, 390–400°, 43% from the chloride, 35% at 370–90° from the bromide; $(iso\text{-}Pr)_2CO$, 380–90°, 35%, $(iso\text{-}Bu)_2CO$, 360°, 28%; $(MeEtCH)_2CO$, 340–50°, traces; $(PhCH_2)_2CO$, 370°, 57% (60% from PhMgOAc at 370–80°); dihexyl ketone, 390–410°, traces; Ph_2CO, 460–500°, 6% (30% from $Mg(OBz)_2$); $(p\text{-}MeC_6H_4)_2CO$, 450°, traces. The following m. ps. are recorded for the anhyd. (probably basic) Mg salts: *acetate*, 357°; *propionate*, 286°, *butyrate*, 275°; *valerate*, 258°, *isovalerate*, 224°, *benzoate*, 320°, *hexahydrobenzoate*, 492°. B. C. A.

Conjugated double bonds. VI. The coloring matter of the Chinese fruit of the gardenia. The occurrence of polyene coloring matter in the plant kingdom. RICHARD KUHN, ALFRED WINTERSTEIN AND WILLY WIEGAND. Zürich. *Helv. Chim. Acta* **11**, 716–24(1928); cf. *C. A.* **22**, 2950.—*Gardenin:* (I), $HO_2CCH{:}(CH.CMe.CH.CH)_3{:}CH\text{-}CO_2H$, the coloring matter in a no. of plants, has now been prepd. in a cryst. form (cf. *C. A.* **16**, 2503) and found to be identical with *α-crocetin* (I) (cf. *C. A.* **21**, 2474). Attempts to isolate β- and γ-crocetin from the seed of *Gardenia grandiflora* L were not successful. Many other plants are named which contain I, which is a deriv. of a tetradecaheptenedicarboxylic acid and is very closely related to bixin (II), $C_{25}H_{30}O_4$, and differs from norbixin by having one less C_5H_6 group (a hydrogenated isoprene group). A table of color reactions with various reagents which distinguish I from II is given. Polyene colors (I, II, carotin, lycopine, etc.) give an intense blue color with concd. H_2SO_4, dark blue to green addn. compds. with Br vapor, characteristic reactions with HCO_2H, Cl_2CHCO_2H, Cl_3CCO_2H, etc., but do not give (*i. e.*, I and II) addn. compds. with picric acid, showing the absence of aromatic rings. I (1.5 g.) was isolated from the finely ground, whole fruit of *Gardenia grandiflora* (1 kg.) by first removing fats with petr. ether, followed by Et_2O, extg. I by shaking 24 hrs. with 70% Me_2CO, filtering, distg. off nearly all the Me_2CO, removing oily impurities with Et_2O, neutralizing the red, aq. residue with NaOH (α-naphtholphthalein indicator), adding 1% excess NaOH, allowing to stand 3 hrs., then warming slightly, acidifying with AcOH and recrystg. the ppt. from Ac_2O. In a similar manner, except that the Me_2CO was removed *in vacuo*, a 0.07% yield of I was obtained from the petals of *Crocus luteus*. It forms a salt $C_{19}H_{20}O_4K_2$; the equivalent weight of I detd. by titration in Me_2CO soln. with 0.025 *N* alkali (α-naphtholphthalein indicator) was found to be nearly 157.1; II gave a value near to 394.2. N. A. LANGE

Saffron coloring matter. III. P. KARRER AND HARRY SALOMON. Univ. Zürich. *Helv. Chim. Acta* **11**, 711–3(1928); cf. *C. A.* **22**, 2949.—β-Crocetin and its Na salt have been purified thoroughly and analyzed. The formula for α-crocetin is $C_{17}H_{20}(CO_2H)_2$, which corrects the formula previously accepted. β-Crocetin and γ-crocetin are the mono-Me and the di-Me esters, resp., of α-crocetin. It is suggested that the developed formula is $HO_2CCH{:}CHCMe.CHCH{:}CHCMe{:}CHCH{:}CHCMe{:}CHC\text{-}HCO_2H$, the location of the Me groups remaining unproved. A. L. HENNE

Quinazolines. I. Mechanism of the reaction between formaldehyde and *p*-substituted aromatic amines in presence of acids. G. MAFFEI. Lab. Lepetit Farmaceutici, Milano. *Gazz. chim. ital.* **58**, 261–9(1928).—5-Nitro-2-aminobenzyl-*p*-nitroaniline (cf. Meyer and Stillich, *Ber.* **35**, 739(1902); Stillich. *Ber.* **36**, 3115(1903)) (6 g.) heated with abs. HCO_2H (40 cc.) for 1 hr. at 140° in a sealed tube with agitation, poured into water (200 cc.), filtered, NH_4OH added to the filtrate, the ppt. dried, pulverized, digested and washed with AcMe and recrystd. from EtOH, gave *6-nitro-2-hydroxy-3-[4-nitrophenyl]-1,2,3,4-tetrahydroquinazoline* (I), m. 207–8°. This compd. had properties identical with those of a compd. assigned a different formula by Stillich (*loc. cit.*). Condensed with Ac_2O it formed an *Ac deriv.* the properties of which were identical with those described by M. and S. for a compd. to which they assigned quite a different formula. Furthermore, with glacial AcOH it formed *6-nitro-3-[4-nitrophenyl]-3,4-dihydroquinazoline* (II), m. 243–6°, identical with that described by M. and

S. A crit. survey of previous literature in conjunction with the present expts. leads to an explanation of the *mechanism of reaction between aromatic p-substituted amines and HCHO in acid medium.* One mol. of HCHO reacts with 2 mols. of amine, forming $CH_2(NHC_6H_4R\text{-}p)_2$. The latter in acid medium then undergoes transposition to 3,6-$R(H_2N)C_6H_4CH_2NHC_6H_4R\text{-}p$. With HCO_2H this forms an intermediate compd. of the type (III), which by elimination of 1 mol. of H_2O forms compds. of the type (IV). The reaction does not proceed exclusively thus, but includes secondary reactions, such as the formation of compds. of the type $p\text{-}RC_6H_4NHMe$, which does not form by direct methylation of the amine first entering the reaction, but results from a methylation which takes place at the same time as a decompn. of the methylene-diamino deriv.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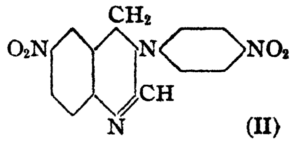
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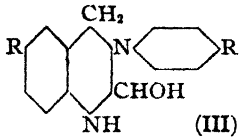
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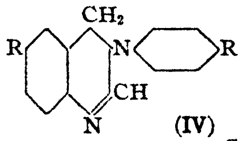
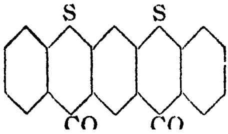

(IV)

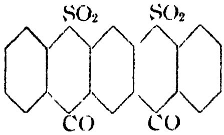
C. C. Davis

Linear dithioxanthone. C. Finzi. R. Univ. di Parma. *Gazz. chim. ital.* **58,** 269–78(1928).—$o\text{-}H_2NC_6H_4CO_2H$ (7.32 g.) in concd. HCl (17 g.), dild. with water, diazotized with $NaNO_2$ (4 g.), the mixt. poured slowly with agitation into thioresorcinol (4 g.) in aq. NaOH (9 g.), heated to 40°, let stand, heated on the water bath, filtered, the filtrate acidified with HCl, filtered, the residue washed with water and recrystd. from AcOH and boiling EtOH, yields *m-phenylenedithio-o-dibenzoic acid* (I), flesh-colored, m. 270°. Oxidized in AcOH with H_2O_2 it is transformed into the corresponding *sulfone.* I added slowly to concd. H_2SO_4 (10 cc. per g. of I) at 100°, heated 2 hrs. at 100°, cooled, poured into ice-water, the ppt. filtered, washed with aq. Na_2CO_3 or NH_4OH and then with water, and the residue recrystd. from boiling C_5H_5N or from a large vol. of $CHCl_3$, yields *dithioxanthone* (II), light yellow, m. 316°, resistant to oxidizing agents, not being attacked even by long boiling in glacial AcOH with $K_2Cr_2O_7$ or H_2O_2. Excess 30% H_2O_2 boiled with I (2 g.) in glacial AcOH (20 cc.), partly evapd., dild. with water, and the ppt. recrystd. from boiling water, yields *m-phenylenedisulfone-o-dibenzoic acid.* $m\text{-}C_6H_4(SO_2C_6H_4CO_2H\text{-}m)_2$ (III), m. 201°, is not dehydrated by concd. H_2SO_4 at 200°. II (1 g.) dissolved in concd. H_2SO_4 (12 cc.), dild. with a few drops of water until turbid, K persulfate (4 g.) added slowly with continuous agitation, let stand several hrs., poured into ice-water, filtered, washed with water, and the residue recrystd. from $PhNO_2$, yields *dibenzophenone disulfone* (IV), yellowish, blackens around 300°, m. 305°. This method of prepn. is essentially that of Ullmann and Glenck (cf. *C. A.* **11,** 2668). II (3 g.) refluxed with K (30 g.) in EtOH (300 cc.), adding Zn dust (40 g.) slowly during 2 hrs., refluxed several hrs. more until the violet color changes to yellow and then to green, filtered hot, dild. with water, partly evapd., acidified with excess HCl, filtered, washed with water, the residue (which is difficult to purify) dissolved in boiling C_6H_6, repptd. with petr. ether, washed with boiling AcOH and recrystd. from boiling xylene, yields *dithioxanthydrol* (V), yellowish, m. 224° (frothing), gives amaranth-red solns. in concd. H_2SO_4 and HNO_3. The *prepn. of diazothio ethers of thioresorcinol* was also carried out. The prepn. of *m-phenylenedithio-o-diazobenzoic acid,* $m\text{-}C_6H_4\text{-}(SN_2C_6H_4CO_2H\text{-}o)_2$ (VI), is similar to that of *m*-phenylenedithiosalicylic acid (cf. *Ber.* **28,** 3237(1895)), it being necessary only that the HCl used in the diazotization be in large excess of the NaOH used in prepg. the thiophenate. The diazo deriv. poured into the alk. thiophenol, the ppt. let stand, filtered and washed, yields VI, which is insol. in almost all solvents (except $CHCl_3$) and cannot be obtained in pure cryst. form. It is transformed into phenylenesalicylic acid by alk. solns. and by boiling EtOH. *m-Phenylenedithiodiazobenzyl alc.,* $m\text{-}C_6H_4(SN_2C_6H_4CH_2OH\text{-}o)_2$ (VII), can be prepd. not only in acid medium but (unlike other thiodiazo ethers) also in alk. medium. The diazo deriv. of $o\text{-}H_2NC_6H_4CH_2OH$ (2 mols.) poured into alk. Na *m*-dithiophenate ppts. VII, yellow, which is not decompd. by prolonged boiling in alk. medium, is difficult to purify, and is sol. only in hot $CHCl_3$, a pitchy substance being deposited on cooling.

2,3-Aminonaphthoic acid (2.63 g.) dissolved in water contg. Na_2CO_3 (1 g.), repptd. by concd. HCl (10 g.), diazotized with $NaNO_2$, aq. thioresorcinol (1 g.) and NaOH (1 g.) added, ppts. *m-phenylene[dithio-2,3-diazonaphthoic] acid*, $C_6H_4(SN_2C_{10}H_6CO_2H)_2$ (VIII), decompd. by aq. alkalies.



(II)



(IV)

(V)

C. C. Davis

Resolution of racemic chlorobromoacetic acid. Hilmar Johannes Backer and Hindrik Willem Mook. State Univ., Groningen. *J. Chem. Soc.* **1928,** 2125-30; cf. *C. A.* **20,** 3686.—ClBrCHCO₂H (I), b_{11} 103 4°, b. 214.5 5° (slight decompn.), m. 31.5°, yields an *acid K* and a *normal K salt*. The elec. cond. at 25° is reported. The *brucine salt* crysts. with 2 or 3 mols H_2O and may be recrystd by shaking with 2 parts H_2O at room temp. and then mixing with 20 parts of boiling H_2O, the salt is optically pure after 5 such crystns. The salt is best decompd. by using excess NaOH and extg the brucine with $CHCl_3$. The rotation of the Na salt is $[M]_D$ 6.3°; the rotation of the free acid in H_2O is greater than that of the Na salt and of opposite sign, it depends on the concn. and is raised by addn. of strong acids. The av. value of $[M]_D$ for the undissociated acid is −28°. The dissociation const., K_{17}, is 8.1 × 10^{-2}. I (0.08 g mol./l.) in 1.38 equivs. H_2SO_4 at 25° shows no racemization after 77 hrs.; at 100° the racemization const. is k_{100} 4.5 × 10^{-2}; the racemization of the salts in neutral soln is negligible; in $CHCl_3$ the racemization of the neutral salts is much faster than in H_2O; a soln. contg. 0.15 g. of Na salt of I and 0.049 g mol. NaOH has k_{25} 9 × 10^{-2}, 0.18 g. Na salt and 0.031 g.-mol NaOH has k_{25} 4.2 × 10^{-2}, the presence of KNO_3 accelerates the racemization in alk. soln while $Ca(NO_3)_2$ causes a greater acceleration than KNO_3. C. J. West

Decomposition of acetyl peroxide and the mechanism of Kolbe's electrosynthesis. Oswald J. Walker. Univ. of Edinburgh. *J. Chem. Soc.* **1928,** 2040 5.—Fichter (*C. A.* **18,** 1438; **20,** 3135) has extended the peroxide theory to electrochem. oxidation in general; W. shows that the exptl. justification for this view is unsound and that there is no necessity to assume that Ac_2O_2 is formed during the electrolysis of acetates. The main arguments against the peroxide theory are: The thermal decompn. of Ac_2O_2, both in the pure state and in soln., does not indicate a reaction according to the equation: $Ac_2O_2 = C_2H_6 + 2CO_2$; CH_4, which is not found in the anode gases during the electrolysis of acetates, is always present among the decompn. products of Ac_2O_2, often in large amts.; peroxides have not as yet been isolated by electrochem. means, even at low temps. at which the peroxides are comparatively stable. The view that the discharged AcO ions, which must necessarily be very unstable radicals, react together to give C_2H_6 and CO_2, still affords the most satisfactory, although perhaps incomplete, explanation of Kolbe's electrosynthesis. In the interaction of these radicals some sort of momentary loose union may well take place prior to a more far-going disruption, but the assumption of the actual formation of the chem. known peroxide is unnecessary and also exptly. unsound. That a small portion of the AcO radicals might unite to form the more stable peroxide would not be surprising and this possibility is not excluded. C. J. West

Action of organomagnesium derivatives on some aliphatic dialkylamides. Marthe Montagne. *Compt. rend.* **187,** 128-31(1928); cf. *C. A.* **20,** 3280 and following abstract.—Reactions previously described by M. may be explained provisionally as follows:

$$PrCONEt_2 + MeMgI + MeI \longrightarrow PrCMe(OMgI)NEt_2MeI. \quad \begin{array}{l} PrC(OMgI)NEt_2 \\ \;\;| \\ H_2C\,|\,H\;\;I\,|\,Me \end{array}$$

$$+ 2\ MeMgI \longrightarrow \begin{array}{l} PrCMeNEt_2 \\ \;\;| \\ CH_2Me \end{array} + 2\ MgI_2 + MgO + CH_4.$$

BuBr, BuI or $PhCH_2Cl$ reacts in the same way as MeI, but less vigorously; BuBr or BuI with $PrCONEt_2$ and MeMgI gives $PrCMe_2NEt_2$ (I) and *PrCMe(CH₂Bu)NEt₂* (II). II, b_{20}

128–9°; *picrate*, m. 78–9°; *chloroaurate*, m. 54°. $PhCH_2Cl$ with $PrCONEt_2$ and MeMgI gives I and *PrCMe*[$(CH_2)_2Ph$]NEt_2 (III), b_{10} 163°; *picrate*, m. 99°; *chloroaurate*, m. 101°. The constitution of II and III, inferred from that of $PrCMe(CH_2Me)NEt_2$ is confirmed by the analysis of the bases and of their derivs.; also, the HCl salt of II gives, when heated, an ethylenic hydrocarbon, b. 161–4°, of which the vapor d. and b. p. correspond to the formula $C_{10}H_{20}$. $PrCMe(CH_2Bu)NEt_2.HCl \longrightarrow NHEt_2.HCl + PrCMe{:}CHBu$ or $EtCH{:}CMeCH_2Bu$. The equation for the reaction of an alkyl halide on $PrCONEt_2$ in the presence of MeMgI is as follows. $PrCONEt_2 + 3\ MeMgI + RX \longrightarrow PrCMe_2NEt_2 + PrCMe(CH_2R)NEt_2$; this is an aliphatic condensation analogous to the Friedel reaction. It furnishes a means for the synthesis of branched-chain tertiary bases having an asym. carbon. M. W. McPherson

Action of organomagnesium compounds on aliphatic dialkylamides. Marthe Montagne. *Compt. rend.* **186**, 874–7(1928).—MgMeI reacts with $PrCONEt_2$ to give the normal product, $PrCMe_2NEt_2$ (*C. A.* **20**, 3280), and also *γ-diethylamino-γ-methylhexane*, b_{16} 81° (*picrate*, m. 78°; *perchlorate*, m. 154°; *chloroaurate*, m. 84°; *chloroplatinate*, m. 199°), the HCl of which decomps. at 170–80° into $NHEt_2$ and γ-methyl-Δ^{β}-hexene, identical with that obtained by the dehydration of γ-methylhexan-β-ol. The new base can be synthesized from $PrCMeEtCONH_2$ by the Hoffmann rearrangement followed by diethylation of the product. Since no trace of PrCMeEtNMeEt is formed in the reaction, the interchange of radicals is improbable; it is suggested that the abnormal product occurs through the presence of free MeI in the reaction mixt. This view is supported by the exclusive production of the base when MeI (1 mol.) is added at the beginning of the reaction. B. C. A.

Mechanism of the acetal reaction. The explosive rearrangement of hydroxyethyl vinyl ether into ethylidene glycol. Harold S. Hill and Lloyd M. Pidgeon. McGill Univ. *J. Am. Chem. Soc.* **50**, 2718–25(1928); cf. Hill and Hibbert, *C. A.* **18**, 1987.—In previous work dealing with the formation of cyclic acetals from $CH{:}CH$ and poly-HO compds., the intermediate compd., *hydroxyethyl vinyl ether* (I), was assumed, which rearranged to give ethylidene glycol (II). This assumption is now verified. By the action of 315 g. Br on 125 g. paraldehyde at −12° (stirring for 10 hrs. at −10°) and the addn. of 135 g. $(CH_2OH)_2$ at −10° (stirring at room temp. for 6 hrs.), there results 80% of $BrCH_2CH(OCH_2)_2$, which may be purified by shaking with 10% NaOH; 140 g. $(CH_2OH)_2$ and 185 g. dibromoparaldehyde, heated on the steam bath for 10 hrs., give 40% of the same compd. The action of Na in Et_2O for 7 hrs. gives 56.4% of I, b_{10} 44–5°, b_{760} 140°, n_D^{17} 1.4564; I is stable when distd. from a slightly alk. soln. but is very sensitive to acids. Benzoate, b_6 133°; this shows no activity in contact with a trace of concd. H_2SO_4. Freshly prepd., pure I rearranges violently with a trace of concd. H_2SO_4, giving II; 2 cc. I, treated with a fraction of a drop of concd. H_2SO_4 with cooling, and, after the rapid reaction has taken place, slowly treated with more I, gives 90% of II. A trace of dry HBr also produces the same instantaneous rearrangement of I into II. Since the Bz deriv. does not rearrange, the HO group must play a sp. role in the transformation. The mechanism of the reaction is elaborated so as to include similar reactions such as those occurring in glucoside and polysaccharide formation. C. J West

Vinyl derivatives: their relationship to sugars and polysaccharides. Harold S. Hill. McGill Univ. *J. Am. Chem. Soc.* **50**, 2725–31(1928).—In order to show that the rearrangement of $CH_2{:}CHOCH_2CH_2OH$ into $MeCH(OCH_2)_2$ represents a general tendency toward cyclization in derivs. of this type, *hydroxypropyl vinyl ether* (I) was prepd.; this undergoes the same violent, quant. rearrangement with a trace of 50% H_2SO_4 or dry HCl, indicating that this is a general type reaction. Paracetaldehyde (132 g.), brominated at −12° with 320 g. Br, and then treated with 240 g. $CH_2(CH_2OH)_2$, gives 55% of bromoethylidenetrimethylene glycol (II), b_{10} 74–5°; with Na in Et_2O, there results 85% of I, b_{10} 64–5°. I, with a few bubbles of dry HCl or with 50% H_2SO_4, gives quant. ethylidenetrimethylene glycol (III), b. 108–10°. I (5.1 g.) and 1.6 g. MeOH, treated with HCl, give 3.5 g. III; with 3 times the quantity of MeOH, the main product is $MeCH(OMe)_2$. II (90 g.) in 250 cc. abs. Et_2O, treated with 23 g. Na, the Et_2O removed and the residue treated with 80 g. MeI, yields 69% of *methoxypropyl vinyl ether* (IV), b_{137} 75–6°. IV (5.5 g.) and 1.5 g. MeOH, treated with a trace of 40% H_2SO_4, give 1 g. $MeCH(OMe)_2$, 2 g. of an intermediate mixt. and 3 g. of the mixed *acetal*, $MeCH(OMe)OCH_2CH_2CH_2OMe$, b. 153–5°. IV and $(CH_2OH)_2$ with dry HCl give as the main products ethylidene glycol and mono-Me ether of trimethylene glycol, b_{15} 86–92°. IV and α-Me glucoside with dry HCl give ethylidene-α-methylglucose, m. 77°. The expts. support the hypothesis that vinyl derivs. are the intermediates through which transformations of this nature take place. C. J. West

Condensation of glycerol. M. Rangier. *Compt. rend.* **187**, 345–6(1928); cf. *C. A.* 7, 3113; **16**, 2038, 3224.—In view of the contradictory information in the literature, R. has studied the condensation of glycerol by heating with 2% AcONa at different temps. and times. The reaction products were acetylated, and the following acetins were isolated and analyzed: $(AcO)_4(C_3H_5)_2O$, b_2 164–5°; $(AcO)_5(C_3H_5)_3O_2$, b_2 194–5°; $(AcO)_6(C_3H_5)_4O_3$, b_2 224–5°; $(AcO)_7(C_3H_5)_5O_4$, b_2 254–5°; $(AcO)_8(C_3H_5)_6O_5$, b_2 284–5°, all of which are viscous liquids, and which were obtained in yields of 10–82 g. from 100 g. glycerol. In pushing the condensation very far, a cryst. acetin was obtained which appears to be the same as a diacetin of the homologous diglyceric alc. from dichlorohydrin, reported by Fauconnier and Sanson (see *Bull. soc. chim.* **48**, 236(1887)).

Frederick C. Hahn

Sulfur-containing derivatives of glycerol. Emil Fromm, Regine Kapeller and I. Taubmann. *Ber.* **61B**, 1353–8(1928).—The compds. (I and II) obtained by the action of $NaHSO_3$ and Na_2SO_3, resp., on epichlorohydrin (III) have hitherto been assigned the structures $ClCH_2CH(OH)CH_2SO_3H$ and $HOCH(CH_2SO_3H)_2$, structures apparently confirmed by Pazscke's observation that II is formed by boiling I with Na_2SO_3. But when I is boiled with NaOH it decomps. with loss of Na_2SO_3, identified by its reduction to SnS_2 with $SnCl_2$ and HCl by the Böttger method. S so easily split off cannot be present as a sulfonic acid but must be in a sulfite ester, *i. e.*, I must be $ClCH_2CH(OH)CH_2OSO_2H$, decompd. by alkalies into Na_2SO_3 and III which then give II. To det. whether or not II also contains S easily split off is not easy for the Na salt of II is, from its method of prepn., contaminated with Na_2SO_3, an impurity not removed when the Na salt is converted into the difficultly sol. Ba salt, since $BaSO_3$ is also difficultly sol., and all prepns. of the Na or Ba salt give the Böttger SnS_2 reaction. But if the salt of II is repeatedly evapd. with HCl, which would decomp. all the metal sulfite and any sulfite ester present, the Ba salt of the unchanged II can still be pptd. with $BaCl_2$, showing that III with a primary sulfite gives a sulfite ester and with a secondary sulfite a true di-SO_3H acid. $PhCH_2SNa$ and III give *S,S'-dibenzyl-α,α'-dithioglycerol* (IV); this with HCl, Ac_2O and BzCl gives oily products which cannot be distd. but that Ac_2O gives the *mono-Ac deriv.*, $AcOCH(CH_2SCH_2Ph)_2$ (V), was shown by oxidizing the oily V to the cryst. *disulfone*, $AcOCH(CH_2SO_2CH_2Ph)_2$ (VI). IV itself with acid $KMnO_4$ gives the corresponding *β,β'-dibenzylsulfoneisopropyl alc.* (VII). crystals with 1 H_2O, which can be converted into V by acetylation. $K_2Cr_2O_7$ and concd. acids merely remove the H_2O of crystn. but the *ketone* $CO(CH_2SO_2CH_2Ph)_2$ (VIII) was finally obtained from $CO(CH_2Cl)_2$ and $NaSCH_2Ph$ and subsequent oxidation of the oily product with $KMnO_4$. The H atoms of the CH_2 groups between the SO_2 and C:O groups in VIII are labile, as would be expected, and readily replaceable by metals and alkyl groups. VIII dissolves more readily in alc. alkalies than in alc. itself. Methylation could not be effected in alc., evidently because the sulfone is decompd. by boiling alkalies, forming $PhCH_2SO_2H$, easily identified as $(PhCH_2)_2SO_2$ when the alkali cleavage is effected in the presence of $PhCH_2Cl$. VIII does not react with the usual ketone reagents ($PhNHNH_2$, NH_2OH, $N_2H_4.H_2O$), but does form mercaptoles. Thus with $PhCH_2SH$ and HCl is obtained an oily *dibenzyl mercaptole*, oxidized to the cryst. *sulfonal* (IX), $(PhCH_2SO_2)_2C(CH_2SO_2CH_2Ph)_2$, also obtained from 2 mols. $PhCH_2SH$, $CO(CH_2Cl)_2$ and dry HCl, subsequent treatment of the oily mercaptole with 2 mols. $PhCH_2SNa$ and oxidation of the resulting tetrasulfide. IV m. 59°. VI m. 159–60°. VII m. 215° and, anhyd., 206–8°, loses its H_2O in boiling glacial AcOH or H_2SO_4 (3 parts concd. acid to 1 of H_2O) but not when heated alone 2 hrs. at 130° or refluxed in alc. NaOH. VIII m. 182°. IX m. 198°.

C. A. R.

The preparation of trinitroresorcinol and some of its salts. Antonin Majrich. Tschech. techn. Hochschule Prag. *Chemicky Obzor.* **2**, 225–7; *Chem. Zentr.* **1927**, II, 2286.—The different methods of W. Friedrich, Merz-Zetter and Escales for the prepn. of trinitroresorcinol were tested, as a result of which the best conditions for the prepn. of this compd. are described. Yields of 95% can be obtained. The following new *salts of styphnic acid* were prepd.: $Hg_2C_6HO_8N_3.9H_2O$, light orange; $Hg(C_6H_2O_8N_3)_2.18H_2O$, by the action of $Hg(NO_3)_2$ on NH_4 styphnate, yellow; $Hg(C_6H_2O_8N_3)_2.5H_2O$, by boiling aq. styphnic acid with HgO, silky; $CdC_6HO_8N_3.25H_2O$, yellow; $ZnC_6HO_8N_3.18H_2O$, yellow; $FeC_6HO_8N_3.20H_2O$, olive-green; $NiC_6HO_8N_3.20H_2O$, green; $MgC_6HO_8N_3.4H_2O$, orange. The order in which these salts decomp. when heated is: Hg, Cd, Zn, Fe, Ni and Mg.

C. C. Davis

By-products of the Gattermann aldehyde reaction. Frank Bell and Thomas A. Henry. Wellcome Chem. Research Labs., London. *J. Chem. Soc.* **1928**, 2215–27.—Thymol, $Zn(CN)_2$ and C_6H_6 were treated with HCl until it ceased to be absorbed, $AlCl_3$ was then added and HCl passed through for 4 hrs.; the resulting products were *m*-

cresolaldehyde (I), $PhCHMe_2$ (II), *p*-thymolaldehyde (*semicarbazone*, m. 226°), a small amt. of *o*-thymolaldehyde (*semicarbazone*, m. 198°) and *dithymylacetonitrile* (III), m. 205°. The action of $AlCl_3$ upon thymol gives II and *m*-cresol, from which I is derived. The yields of I and II were greatest when the yield of aldehyde was least. Carvacrol, similarly treated, gives the following products: *o*-cresolaldehyde; *4-hydroxy-3-aldehydo-5-methyl-2-isopropylphenyldicarvacrylmethane*, isolated as the *semicarbazone*, pale yellow, m. 275°; *o*-carvacrolaldehyde (*semicarbazone*, m. 180°); *p*-carvacrolaldehyde (*semicarbazone*, m. 224°); *dicarvacrylacetonitrile* (IV), m. 240°. $AlCl_3$ and carvacrol give *o*-MeC_6H_4OH and $PhCHMe_2$. Carvacrol, $CHCl_3$ and NaOH give a mixt. of the *o*-aldehyde with a little *p*-aldehyde. *o*-MeC_6H_4OH with $Zn(CN)_2$ and HCl gives a mixt. of the *o*-cresolaldehyde (*semicarbazone*, m. 248° (decompn.)) and the *p*-aldehyde (*semicarbazone*, m. 216°). No cryst. material could be isolated from the gums obtained by the action of KCN on alc. solns. of *o*-HOC_6H_4CHO, *p*-HOC_6H_4CHO or carvacrolaldehyde, either alone or when mixed with PhOH or carvacrol, resp. Thymolaldehyde, thymol and KCN give III. With $Zn(CN)_2$ and HCl there results *trithymylmethane*, m. 280°; *Ac deriv.*, $C_{37}H_{46}O_6$, m. 186°. *Tricarvacrylmethane*, m. 275°; *Ac deriv.*, m. 185°. Thymolaldehyde and thymol in abs. EtOH were treated with dry HCl, then $ZnCl_2$ was added and the mixt. boiled for 2 hrs., giving III quant.; no combination occurs when $ZnCl_2$ is omitted. III is not attacked by boiling HCl or by 50–65% H_2SO_4. Heating with EtOH-KOH gives *dithymylacetamide*, m. 243° (decompn.). III yields a *di-Ac deriv.*, m. 174°. IV yields a *di-Ac deriv.*, m. 196°. Thymolaldehyde and carvacrol or carvacrolaldehyde and thymol give *thymylcarvacrylacetonitrile*, m. 227°; *di-Ac deriv.*, m. 145°. *Tolylthymylacetonitrile*, m. 153° (*di-Ac deriv.*, m. 131°); *tolylthymylacetamide*, m. 211°; 10% HCl gives *tolylthymylacetic acid*, m. 188°. *p-Hydroxyphenylthymylacetonitrile*, m. 144°; *Me ether*, m. 106°. *o-Hydroxyphenylthymylacetonitrile*, m. 142°. *Catechylthymylacetonitrile*, m. 147–9°. *m-Hydroxyphenyldithymylmethane*, m. 165°. *o*-$O_2NC_6H_4CHO$ gives only the HCN addn. product. *m-Nitrophenyldithymylmethane*, m. 171°; *p-NO_2 deriv.*, m. 145°; *p-Cl deriv.*, m. 156°; *o-Cl deriv.*, m. 138°. C. J. West

Stereochemistry of fluorene series, citric acid, etc. III. Isomerism of citric acid. K. Nakamura. Osaka Ind. Research Inst. *J. Pharm. Soc. Japan* No. **539**, 47–9 (1927).—In paper II, it was concluded that citric acid (I) has 2 isomers, one of which is labile and is represented by the so-called hydrated form (II) (softens at 70–5°), and the other (III), m. 153°, is obtained by dehydration of II. The evidences for the existence of isomerism were the facts that I and diphenyleneglycolic acid (IV) resemble each other greatly in chem. and phys. properties; the existence of isomerism in the fluorene derivs. when 2 different substituents are located at position 9; and that III cannot be converted back to II by a simple crystn. from H_2O. Further to substantiate the former conclusions, the absorption spectra of aq. solns. of both modifications were compared. As expected, they showed entirely different absorption. In contrast to II, III showed a strong absorption in the ultra-violet region, and its aq. soln. showed a strong fluorescence in a dark room with Fe monochromatic light. X-ray studies are now being made. Nao Uyei

Preparation of β-iodoethylurethan. S. Kuroda. *J. Pharm. Soc. Japan* No. **539**, 44–7(1927).—*First Method.*—Heating of 32.5 g. $Cl(CH_2)_2OH$ and 61 g. NaI in 80 cc. EtOH gave 39 g. $I(CH_2)_2OH$ (I); 20 g. of I and about 20 g. of $COCl_2$ gave $I(CH_2)_2OCOCl$ (III); III with NH_3 gave $I(CH_2)_2OCONH_2$ (IV), m. 93°. *Second Method.*—Passing about 12 g. of $COCl_2$ into 20 g. $Cl(CH_2)_2OH$ gave $Cl(CH_2)_2OCOCl$, (V). V with NH_3 gave $Cl(CH_2)_2OCONH_2$ (VI), m. 76°. Heating 11 g. of VI and 26 g. of NaI in 40 cc. EtOH gave 7 g. of IV. Nao Uyei

Oxidation of α-monobenzoylglycerol. S. Aoyama. Tokyo Imp. Hyg. Lab. *J. Pharm. Soc. Japan* **539**, 27–39(1927).—Prepn. of α-glyceryl phosphate (I) by Fischer's method (*Ber.* **53**, 1606) and its β-isomer (II) by King's method (*C. A.* **8**, 3023) in order to study their structures led to the isolation of the same product. Since the oxidation of I or II should give an aldehyde or ketone, different in each case, this reaction was used to study the structure of *α-monobenzoylglyceric acid* (III). Oxidation of III with CrO_3, $KClO_3$ or Br_2-H_2O gave an acid or resinous products with no intermediate products, while with NaOBr, *α-benzoylglyceric aldehyde* (m. 106–10°; *semicarbazone*, decomps. 160–2°; *oxime*, m. 117–8°), *benzoyldihydroxyacetone* (*semicarbazone*, decomps. 156–8°), *α-benzoylglyceric acid* (m. 141–2°) and benzoylglycolic acid (?) were obtained. Oxidation with $MnSO_4$ or PbO_2 and HCl gave *benzoylglycolic aldehyde* (m. 32–4°, b_9 124–6°; *semicarbazone*, m. 194–5°; *oxime*, m. 78–81°). The above reactions show that the acyl group in III is in α-position and F.'s synthesis of α-glyceride is correct. N. U.

Preparation of thioglycolic and thiolactic acids by electroreduction. Erik Larsson.

Svensk Kem. Tid. **40,** 149–50(1928); cf. following abstr.—$CH_2(SH)CO_2H$(I) was prepd. from $S_2(CH_2CO_2H)_2$ and $MeCH(SH)CO_2H$(II) from $S(SCHMeCO_2H)_2$ by electrolysis with 2*N* H_2SO_4 as electrode solns. and semicylindrical Pb plates as electrodes. For I the c. d. 0.02 amp./sq. cm. and for II, 0.04. The precursors were poured into a porous cup which was placed in a beaker contg H_2SO_4 and the anode. A spiral stirrer was placed in the cathode liquor. A cooling bath was not necessary. The yield for I was 70–80% and for II 80–90%. The precursor of I was prepd. from CH_2ClCO_2Na + Na_2S and that of II from $AcCO_2H$ and H_2S. A. R. ROSE

Electrolytic reduction of dithiodiglycolic acid. ERIK LARSSON. Univ. Lund. *Ber.* **61B,** 1439–43(1928); cf. preceding abstr.—The reduction of $(SCH_2CO_2H)_2$ (I) at Pt and Pb cathodes in 2 *N* H_2SO_4 was studied with polarization and direct reduction expts. With Pb as the cathode I can be reduced practically completely to $HSCH_2CO_2H$ either at a const. cathode potential or with const. c. d. The current yields are in general somewhat larger with const. cathode potentials, but equally good current yields can be obtained by using a sufficiently small c. d., although the reduction then requires a somewhat longer time. C. A. R.

An improvement in our method for the preparation of lactic acid. V. SHAPOSHNIKOV AND A. MANTEIFEL. *Trans. Sci. Chem.-Pharm. Inst., Moskow* (Russ.) **1927,** No 18, 26–9; *Chem. Zentr.* **1927,** II, 1713.—Supplementary to a previous communication (cf. *C. A.* **21,** 4011), it is shown that extn. of albuminous substances by Ca lactate soln. is preferable to extn. with $MgSO_4$ soln. The application of wash water contg. lactic acid after complete neutralization with $CaCO_3$ is then described. C. C. DAVIS

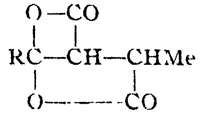
Abietic acid. G. DUPONT, J. DUBOURG AND G. ROUIN. Inst. du Pin. *Chimie et industrie* Special No., 549–51(April, 1928).—See *C. A.* **22,** 123. A. P.-C.

Tetradecenic acid from sperm oil. MITSUMARU TSUJIMOTO. Imp. Inst. Chem Techn. Tokyo. *Chem. Umschau Fette, Oele, Wachse Harze* **35,** 227(1928) – In 1923 T. isolated from sperm oil the liquid 5,6-tetradecenic acid, $CH_3(CH_2)_7CH{:}CH(CH_2)_3$-COOH, which he now wishes to name "*physeteric*" acid. P. ESCHER

The constitution of tetradecenic acid from Tsuzu oil. MITSUMARU TSUJIMOTO *Chem. Umschau Fette, Oele, Wachse Harze* **35,** 225–7(1928) —The oil was obtained from the seed of "tsuzu" or "Shirodamo" (*Tetradenia glauca,* Matsum) belonging to the family of the Lauraceae. The acid was isolated by fractionating the Me esters of the fatty acids at about 15 mm., sapong. the fraction 155–170°, sepg. the solid acids by the Pb salt-ether method, esterifying the satd. acids and collecting fraction 158–168°, which yielded 2% of the tetradecenic acid of n_D^{15} 1.4572. It was then ozonized, decomposed by H_2O at 100°, extd. with ether and the ether soln. shaken with $NaHCO_3$ soln.; this gave 3 products: (1) the ether soln., which yielded on fractionating at 15 mm. and treatment with semicarbazide-HCl 0.4 g. of white crystals of semicarbazone of capraldehyde, m. 96°, and after recrystn., m. 102–102.5°. The higher fraction yielded nearly 2 g. capric acid. (2) The $NaHCO_3$ soln., which was acidified and extd. with ether, yielded succinic acid. (3) The aq. soln. likewise yielded succinic acid and its half aldehyde. Thus the constitution was proved to be 4,5-tetradecenic acid, $CH_3(CH_2)_8CH{:}CH(CH_2)_2COOH$. T. proposes for it the name of tsuzuic acid. P. ESCHER

Constitution of protolichestearic acid. I. Y. ASAHINA AND M. ASANO. Tokyo Imp. Univ. *J. Pharm. Soc. Japan.* No. **539,** 1–17(1927).—By Et_2O extn. of *Cetraria islandica Ach. f. angustifolia, Kraplh.,* a subalpine moss in Japan, *l-protolichestearic acid* (I), $C_{19}H_{32}O_4$, m. 105°, $[\alpha]_D^{27}$ —12.71°, was isolated in 1.3% yield. It is the optical antipode of the *d*-acid found in European lichens. I, H_2 and Pt black gave *dihydroprotolichestearic acid,* $C_{19}H_{34}O_4$, m. 101°. I and $H_2NCONHNH_2$ gave the *semicarbazone,* m. about 140°. These reactions indicate the presence of a double bond in α,β-position to the CO group. Oxidation of I with $KMnO_4$ gave myristic acid, while the oxidation with O_3 and subsequent decompn. with H_2O gave besides HCO_2H and $(CO_2H)_2$, *α-hydroxypentadecylic acid,* $C_{14}H_{28}(OH)CO_2H$. Heating of I with Ac_2O resulted in an isomeric change and gave *l-lichestearic acid* (II), $C_{19}H_{32}O_4$, m. 124°, $[\alpha]_D^{26}$ —32.66°. Heating of II with 10% KOH gave with CO_2 evolution, *lichesteryl acid* (III), $C_{18}H_{34}O_3$, m. 83–4°. III has previously been prepd. by Sinnhold (*Ann.* **55,** 144), but the nature of the third O atom remained unexplained. Heating of the oxime of III with H_2SO_4 resulted in Beckmann rearrangement and gave an *acid amide* (IV) $C_{18}H_{35}(NO_3)$, m. 102°. IV and concd. HBr in a closed tube gave tridecylamine and methylsuccinic acid. The above reactions show that III has 2 possible structures $RCOCH_2CHMeCO_2H$ or $RCOCHMeCH_2CO_2H$(R = $Me(CH_2)_{12}$—). Heating of II in a vacuum at 20 mm. and 210° gave *lichesteryl lactone* (V), b. 207°, which on sapon. with KOH gave III.

V, H_2 and Pd-$BaSO_4$ gave the *dihydro deriv.* of V, m. 37–8°, while V, O_3 and H_2O gave AcOH as a decompn. product. Contrary to the view of Boehm (*Arch. Pharm.* **241**, 1) V is therefore unsatd. The above reactions show that the relation of III to V is like that of levulinic acid to angelic lactone. Hence V has one of the following 4 possible structures: (*a*) R—CH.CH:CMe.CO.O, (*b*) R—C:CH.CHMe.CO.O, (*c*) RCH.CMe:CH.CO.O, (*d*) RC:C.Me.CH_2.CO.O. But the fact that the ozonide of V gave AcOH instead of $(CO_2H)_2$ favors the structure (*a*) for V, while III should have the structure, $RCOCH_2CH(Me)CO_2H$. I, therefore, has one of the 2 possible structures, RCH.CH(CO_2H) C(.CH_2)CO.O or RCH.C(CO_2H):CMe.CO.O. Since the ozonide of I gave HCO_2H and $(CO_2H)_2$ instead of AcOH, the former structure is preferred. From the fact that I did not give III, but II gave III by sapon. with an alkali, the following structure is assigned for III.



NAO UYEI

The rate of saponification of the esters of unsaturated alcohols. M. H. PALOMAA AND ARVO JUVALA. *Ber.* **61B**, 1770 6(1928).—The rate of acid and alkali sapon. has been detd. for allyl formate, Δ^3-butenyl formate, Δ^4-pentenyl formate, vinyl acetate, allyl acetate, Δ^3-butenyl acetate, Δ^4-pentenyl acetate. The rate decreases as the no. of CH_2 groups increases for both acid and alkali sapon., the change being much larger for the latter RAYMOND H. LAMBERT

The separation of liquid and solid aliphatic acids. V. VESELY AND J. HAAS. École Polytechnique Tchèque de Brno. *Chimie et industrie* Special No., 507–15(April, 1928).—A detailed description of expts. carried out with a view to sepg. liquid from solid aliphatic acids by formation of their hydrazides. The solubilities of the hydrazides obtained from $PhNHNH_2$ in the ordinary org. solvents were found to be too similar for the end in view. With α-naphthylhydrazine there is decompn. with formation of $C_{10}H_8$; with β-naphthylhydrazine condensation takes place readily, but the solubilities of the hydrazides of the various acids did not permit of sepg. them. Secondary hydrazides (prepd. with α,α methylphenyl-, diphenyl-, di-p-tolyl- and phenyl-2,4-xylylhydrazine) gave similar results, except that stearic phenylxylylhydrazide is almost insol. in cold alc. while the corresponding oleic hydrazide is easily sol.; unfortunately the prepn. of the reagent was so difficult that sufficient could not be obtained to attempt the sepn of the 2 acids. Secondary dihydrazides were prepd. from diphenylmethanedimethyldihydrazine (I), first prepd. by J. von Braun (*C. A.* **2**, 2804, 2806), and from *diphenyldimethyldihydrazine* (II). The solubilities of oleic and stearic dihydrazides obtained from II are too similar to permit of their sepn.; but by means of the hydrazides obtained from I oleic and stearic acids can be sepd. at least as completely as by means of their amides, anilides, Pb, Ba, etc., salts. In most cases the hydrazides were prepd. *via* Strache and Iritzer (*Monatsh.* **14**, 37(1893)) by refluxing the acid about 1 hr. at 130–40° with 50% excess of the hydrazine. *Palmitic phenylhydrazide*, m. 110°, is easily sol. in alc., Me_2CO, $CHCl_3$, C_6H_6, anhyd. AcOH and benzine (b. 90–100°). *Stearic phenylhydrazide*, m. 111°, is less sol. in alc. and Me_2CO than the palmitic deriv., but is easily sol. in $CHCl_3$ and C_6H_6. *Oleic phenylhydrazide*, m. 92–3°, is difficult to prep. and is obtained only in small yield. *Erucic phenylhydrazide*, m. 82–3°, is easily sol. in org. solvents. *Brassidic phenylhydrazide*, m. 98°, is very easily sol. in alc. *10-Hydroxystearic phenylhydrazide* was obtained as a white powder, m. 106–7°, very easily sol. in alc. *Myristic phenylhydrazide*, m. 108°, is more easily sol. in org. solvents than the palmitic deriv. *Lauric phenylhydrazide*, m. 105–6°, is more easily sol. in org. solvents than hydrazides of acids contg. more C atoms. *Δ^9-Elaidic phenylhydrazide*, m. 98–9°. *Δ^{10}-Elaidic phenylhydrazide*, m. 101°. *Stearic β-naphthylhydrazide*, prepd. by heating 2 hrs. at 110–20° (at higher temps. the hydrazide is partially decompd.), m. 132–3°, is insol. in Et_2O and benzine, sol. in cold C_6H_6 and in hot Me_2CO, $CHCl_3$ and CCl_4, and slightly sol. in hot alc. *Palmitic β-naphthylhydrazide*, m. 134–5°, is a little more sol. in alc. than the stearic deriv. *Myristic β-naphthylhydrazide*, m. 139°. *Lauric β-naphthylhydrazide*, m. 136°, is a little more easily sol. in alc. than the hydrazides of acids contg. more C atoms. *Erucic β-naphthylhydrazide*, m. 106–7°, is very slightly sol. in Et_2O and boiling petrolic ether, easily sol. in Me_2CO, $CHCl_3$, CCl_4,

and anhyd. AcOH. *Brassidic β-naphthylhydrazide*, m. 121–2°, is less sol. in alc. than the erucic deriv. Attempts to prep. oleic β-naphthylhydrazide and the α-naphthylhydrazides of the higher fatty acids were unsuccessful. The phenyl- and β-naphthylhydrazides can be sapond. by heating 30 min. with 10 parts of 50% (by wt.) H_2SO_4, dilg. with an equal vol. of H_2O and heating for 30 min. *Stearic α,α-methylphenylhydrazide*, m. 78.5°, is insol. in Et_2O and benzine, easily sol. in cold C_6H_6, sol. in hot alc., Me_2CO, CCl_4 and anhyd. AcOH. *Palmitic α,α-methylphenylhydrazide*, m. 74°, has solubilities similar to those of the stearic deriv. *Myristic α,α-methylphenylhydrazide*, m. 63°, is very easily sol. in hot alc. *Lauric α,α-methylphenylhydrazide*, m. 56°. *Erucic α,α-methylphenylhydrazide*, m. 74°, is very easily sol. in alc. *Brassidic α,α-methylphenylhydrazide*, m. 69°, is less sol. in alc. than the erucic deriv. Oleic α,α-methylphenylhydrazide could not be obtained. *Stearic diphenylhydrazide*, obtained by heating 90 min. at 180–90°, m. 122.5°, is slightly sol. in hot alc. *Palmitic diphenylhydrazide*, m. 124°, is a little more sol. in alc. than the stearic deriv. *Oleic diphenylhydrazide*, m. 83–6°. *Erucic diphenylhydrazide*, m. 88°. *Brassidic diphenylhydrazide*, m. 106°. *10-Hydroxystearic diphenylhydrazide*, m. 124–5°, is easily sol. in alc., Me_2CO and $CHCl_3$. Comparison of *di-p-tolylhydrazine* prepd. *via* Lehne (*Ber.* 13, 1546) (A) and *via* Wieland (*C. A.* 3, 181) (B) showed that A is the *mono-Ac deriv. of ditolylhydrazine*, m. 171–2°, and B is true ditolylhydrazine, m. 93°. *Stearic di-p-tolylhydrazide*, m. 115–6°, insol. in Et_2O. *Oleic di-p-tolylhydrazide*, m. 79–80°, but analysis showed the product obtained was impure (N 7.30%, instead of a theoretical 5.88%). *Phenyl-2,4-xylylhydrazine*, prepd. from phenylxylylnitrosoamine by the method used by Wieland (*C. A.* 3, 181) for the prepn. of di-*p*-tolylhydrazine, m. 70–1°, easily sol. in hot alc. and in Et_2O and petrolic ether, readily oxidized on standing in the air. *Stearic phenyl-2,4-xylylhydrazide*, m. 119–20°, easily sol. in hot alc. *Oleic phenylxylyl-2,4-hydrazide*, m. 92–3°, fairly sol. in alc., insol. in Et_2O. *Stearic diphenylmethanedimethyldihydrazide*, obtained by heating the hydrazine with excess of stearic acid at 140°, m. 145–6°, is insol. in Et_2O, petrolic ether, hot Me_2CO, AcOEt, very slightly sol. in alc., very easily sol. in hot AcOH, C_6H_6, CCl_4, $CHCl_3$ and AmOH. *Palmitic diphenylmethanedimethyldihydrazide*, m. 148°. *Lauric diphenylmethanedimethyldihydrazide*, m. 147–8°, is fairly sol. in hot alc. and Me_2CO. *Oleic diphenylmethanedimethyldihydrazide*, m. 122°, is much more sol. in most solvents (especially Me_2CO and alc.) than the corresponding derivs. of satd. acids, is insol. in Et_2O and ligroin. *Δ^9-Elaidic diphenylmethanedimethyldihydrazide*, m. 127°, is slightly less sol. than the oleic deriv. *Δ^{10}-Elaidic diphenylmethanedimethyldihydrazide*, m. 136°. *Dimethyldiphenyldihydrazine* was prepd. by treating dimethylbenzidine in alc. and HCl with $NaNO_2$, sepg. the nitrosoamine (m. 211–2°), suspending in a 1:1:1 mixt. of alc., H_2O and AcOH, reducing with Zn powder, filtering and liberating the base with NaOH. Recrystg. from ligroin gives colorless needles, m. 90–1°, gradually turning yellow when exposed to the air. It is preferable to reduce by the method used by Wieland for the reduction of nitrosodi-*p*-tolylamine. The *diphenyldimethyldihydrazides of stearic and oleic acids* are more difficult to obtain than the other aryl hydrazides, and the quantities obtained were barely sufficient to make m. p. detns. Both are very sol. in alc. and cannot be sepd. by crystn. from this solvent. The stearic deriv. m. 131–2° and the oleic m. 104–5°, but the products obtained were impure. A. PAPINEAU-COUTURE

Transformation of methylpropionylcarbinol to ethylacetylcarbinol. E. VÉNUS-DANILOFF. *Bull. soc. chim.* 43, 582–6(1928).—MeCH(OH)COEt (I) is prepd. by treating Et_2CO with Br, and hydrolyzing the resulting MeCHBrCOEt on the water bath with H_2O and $BaCO_3$. I b_{761} 152.5°, b_{20} 60–0.5°, d_0^0 0.9943, d_{20}^{20} 0.9771, d_4^{20} 0.9742, MR 26.82; *semicarbazone*, m. 208–9°. I heated with alc. contg. a few drops of concd. H_2SO_4 in a sealed tube at 127–8° for 8 hrs. is transformed to EtCH(OH)COMe (II), b_{761} 147–8°, b_{27} 59–9.5°, d_0^0 0.9673, d_{20}^{20} 0.9516, d_4^{20} 0.9500, MR 27.09; *semicarbazone*, m. 216–7°. II and MeMgBr give $EtCH(OH)C(OH)Me_2$, b_{112} 122°, d_0^0 0.9764, d_{20}^{20} 0.9643, d_4^{20} 0.9627, MR 32.76. FREDERICK C. HAHN

The action of acetic anhydride and pyridine on amino acids. P. A. LEVENE AND ROBERT E. STEIGER. Rockefeller Inst. *J. Biol. Chem.* 79, 95–103(1928); cf. *C. A.* 21, 3900.—The main products of the action of Ac_2O and C_5H_5N on phenylaminoacetic acid, phenylalanine and *l*-tyrosine are CO_2 and derivs. of acetylaminoacetone of the formula $RCH(NHCOCH_3)COCH_3$. With phenylmethylaminoacetic acid there is no loss of CO_2; the reaction product is the acetylated amino acid indicating the importance for the reaction of a mobile H on the C atom (2). The following mechanism for the reaction is suggested: Under the influence of C_5H_5N enolization occurs, permitting the entry of an Ac group on the (OH)-H of the CO_2H;

there is then a migration of the Ac group to C atom (2) followed by CO_2 elimination with the formation of the ketone. Azlactones are probably formed as secondary products of the reaction. The constitution of the ketonic compds. was established by their conversion into the corresponding hydrochlorides and pyrazines. *1-Benzyl-1-acetylaminoacetone*, m. 95–95.5°. *1-Benzyl-1-aminoacetone-HCl*, m. 123–5°. *3,6-Dimethyl-2,5-dibenzylpyrazine*, m. 100–100.5°. *1-(Acetyl-p-hydroxybenzyl)-1-acetylaminoacetone*, m. 123–4°. *1-(p-Hydroxybenzyl)-1-aminoacetone-HCl*, m. 165–6° with decompn. *3,6-Dimethyl-2,5-di(p-hydroxybenzyl)pyrazine*, no m. p. given. *Acetylphenylmethylaminoacetic acid*, m. 192–3.5°. A. P. Lothrop

Salt formation with the amino acids. J. V. Dubsky. *Z. med. Chem.* **5**, 37–42; *Chem. Zentr.* **1927**, II, 914.—Critical review of the work on the formation of salts and double salts of the amino acids, particularly *glycine*. *Glycine-zinc chloride*, $ZnCl_2.3NH_2CH_2CO_2H$, crystallizes from an aq. soln. of the components, decomps. 228° and changes to an orange-red color. J. S. Reichert

Transformation of methylbenzoylcarbinol to phenylacetylcarbinol with sulfuric acid and under conditions of alcoholic fermentation. E. M. Kotchergine. *Bull. soc. chim.* **43**, 573–5(1928).—EtCOPh and Br give MeCHBrCOPh (I), b_{18} 134–5°, d_0^0 1.454, strong lachrymator. I heated with H_2O and $BaCO_3$ on the water bath, with energetic stirring, gives 69–81% BzCH(OH)Me (II), b_{13} 125–6°. II (10 g.) in 40 cc. alc. contg. 3 drops concd. H_2SO_4 in a sealed tube 8 hrs. at 120–5° gives PhCH(OH)Ac. This transformation was also realized under conditions of alc. fermentation. Frederick C. Hahn

Transformation of ethylbutyrylcarbinol to propylacetylcarbinol. E. Vénus-Daniloff. *Bull. soc. chim.* **43**, 575–82(1928).—Pr_2CO in Et_2O with Br gives 50% PrCOCHBrEt (I) and 34% of the dibromoketone (II). PBr_5 in place of Br gave 30% I. I, b_{17} 82–3°, d_0^0 1.2717, d_4^{20} 1.2433, irritates mucous membranes, II, b_{17} 100–1°, d_0^0 1.5572, d_4^{20} 1.5234. PrCOCH(OH)Et (III), b. 181–2°, b_{18} 75–6°, b_{26} 86–7°, d_0^0 0.9488, d_0^{20} 0.9326, d_4^{20} 0.9309, MR 36.06, is obtained in 43% yield by heating II on the water bath with aq. K_2CO_3, or water and freshly prepd. $CaCO_3$ or $BaCO_3$. *Semicarbazone* of III, m. 117–8°. Reduction of III, with Me_3CMgCl, gives 20% PrCH(OH)CH(OH)Et, b_{21} 117.5–8°, m. 98–9°. III is unstable during distn., forming some condensation products which upon hydrolysis with 2% H_2SO_4 28 hrs. on the water bath give PrCH(OH)COEt (IV), b. 176–7°, b_{18} 74–5°, b_{26} 83–5°, d_0^0 0.9395, d_{20}^{20} 0.9250, d_4^{20} 0.9235, MR 36.08 (*semicarbazone*, m. 121–2°) and $(PrCOCHEt)_2O$, b_{20} 151–1.5° (*semicarbazone*, m. 178–9°). III is transformed to IV by heating with 4 vols. alc. contg. a small quantity of concd. H_2SO_4, 8 hrs. at 120–30°. Frederick C. Hahn

Action of phosphorus pentachloride on ethyl tertiary-butyl ketone. Transformation of methyldimethylacetylcarbinol. Vl. Vassliev. *Bull. soc. chim.* **43**, 563–7 (1928).—$EtCOCMe_3$ and PCl_5 at 70° give $MeCHClCOCMe_3$ (I), b_{22} 84°, $d_4^{20,0}$ 0.9814, 0.9993. I heated in sealed tube with 3 mols. HCO_2K and 2 vols. MeOH, 10 hrs. at 150° gives $Me_3CCH(OH)COMe$ (II), b_{100} 108–11°, $d_4^{0,20}$ 0.9523, 0.9352, MR 36.01 (*semicarbazone*, m. 188°); and, due to the reducing action of the HCO_2K, $Me_3CCH(OH)CH(OH)Me$, m. 54°. II and MeMgBr give $Me_3CCH(OH)C(OH)Me_2$ (III), which upon oxidation with 4% $KMnO_4$ gives $Me_3C\overline{C(OH).O.C}Me_2$ (IV), m. 52°. III exists in 2 cryst. forms, isotropic crystals decompg. in the air, and crystals belonging to monoclinic syngonimetry and rhomboprismatic symmetry. II and PhMgBr give $Me_3CCH(OH)C(OH)MePh$, m. 82.5°, and $Me_3CCPh(OH)CH(OH)Me$, m. 94°. Frederick C. Hahn

Mechanism of osazone formation. B. Glassmann and Mrs. Rochwarger-Walbe. Nahrungsmittel-Trust, Odessa. *Ber.* **61B**, 1444–51(1928).—$PhNHNH_2$ in AcOH heated in the air, besides decompg. according to the equation $2PhNHNH_2 + O_2 = Ph_2NNH_2 + N_2 + 2H_2O$, also decompgs. chiefly (*in vacuo* exclusively), as the result of autoreduction, according to the equation $2PhNHNH_2 = C_6H_6 + PhNH_2 + NH_3 + N_2$. According to the Fischer formulation, osazone formation is also related with a peculiar reduction to NH_3 and $PhNH_2$ of the otherwise difficultly reducible $PhNHNH_2$, but the quantity of either NH_3 or $PhNH_2$ formed has never been detd. quant. and it has been suggested that possibly the $PhNHNH_2$ in the osazone formation in acid soln. directly oxidizes the hydrazone: $PhNHNH_2 + H_2O = PhNH_2 + NH_3 + O$. G. and R.-W. accordingly undertook to measure quant. the NH_3 formed and devised a method for detg. small quantities of NH_3 in the presence of $PhNHNH_2$. The tedious Fuchs and Nissel method (*C. A.* **21**, 1650) did not prove satisfactory for the large

series of detns. of small quantities of NH_3 which had to be made. Permutite in very dil. solns. of $PhNHNH_2$, $PhNH_2$ and NH_3 quant. adsorbs the NH_3 while the $PhNHNH_2$ and $PhNH_2$ can be quant. washed away, and the NH_3, liberated with alkali, can then be very accurately detd. colorimetrically with Nessler soln. Detn. of the NH_3 and N_2 liberated from $PhNHNH_2$ in AcOH on the H_2O bath showed that the $PhNHNH_2$ undergoes partial autoreduction to C_6H_6, $PhNH_2$, NH_3 and N_2. The NH_3 values of the osazone filtrates are quant. equal to the sum of the NH_3 resulting from the reduction of the $PhNHNH_2$ according to the Fischer formulation of osazone formation, plus that produced by the thermal autoreduction of the $PhNHNH_2$, plus that already present (presumably as the result of autoreduction) in the com. $PhNHNH_2$.

C. A. R.

Use of toluenesulfonic esters in place of halogen esters in malonic ester syntheses. DAVID H. PEACOCK AND PO THA. Univ. of Cambridge. *J. Chem. Soc.* **1928**, 2303–5.—The reaction between $CHNa(CO_2Et)_2$ and esters of *p*-$MeC_6H_4SO_3H$ takes place much more slowly than when the halogen esters are used but they are equally suitable, in spite of a similar tendency to form dialkylmalonic esters from equimol. proportions of $CHNa(CO_2Et)_2$ and toluenesulfonic esters. $CH_2(CO_2Et)_2$ (16 g.), 18.6 g. *p*-$MeC_6H_4SO_3Me$, 2.3 g. Na and 78 cc. EtOH, boiled 4 hrs., give 13.9 g $MeCH(CO_2Et)_2$. *p*-$MeC_6H_4SO_3Et$ gives 68% of $EtCH(CO_2Et)_2$. $PhOCH_2CH_2OH$ (70 g.), 100 g. *p*-$MeC_6H_4SO_2Cl$ and 100 cc. NaOH give 90% of *β-phenoxyethyl p-toluenesulfonate*, m. 80°; with $CHNa(CO_2Et)_2$ this gives $PhOCH_2CH_2CH(CO_2Et)_2$, m. 134–6°. C. J. WEST

New method for the preparation of mono esters of diacids. E. FOURNEAU AND S. SABETAY. Pasteur Inst. *Bull. soc. chim.* **43**, 859–61(1928); cf. *C. A.* **21**, 3890.—Heating the di-*Et* esters (I) and the corresponding free acids (II) in an oil bath for 4–6 hrs., gave *mono-Et esters* of the following acids: at 130°, *oxalic* (330 g.) from 600 g. of I and 348 g. of II; at 180–200°, *succinic* (40 g.), b_{17} 146–9°, n_D^{21} 1.4323, d_{21} 1.148, from 87 g. of I and 65 g. of II; at 250°, *adipic*, b_{17} 169–70°, m. 28–9°, n_D^{20} 1.4384, d_{20} 1.081, from 55 g. of I and 42 g. of II; at 280°, *suberic* (37 g.), b_{16} 186–8.5°, m. 21–2°, n_D^{23} 1.4412, d_{23} 1.037, from 58 g. of I and 44 g. of II; at 280–300°, *sebacic* (13 g.), m. 35°, b_{15} 202–3°, from 26 g. of I and 21 g. of II. A. S. CARTER

Electrometric titration curves of dibasic acids. II. β-Substituted glutaric acids. RICHARD GANE AND CHRISTOPHER K. INGOLD. Univ. of Leeds. *J. Chem. Soc.* **1928**, 2267–72.—The titer and p_H are given for a no. of β-substituted glutaric acids; the following figures represent the values of the 1st (k_1) and 2nd (k_2) electrometric dissociation consts. and the calcd. value of the apparent distance (r) between the CO_2H groups (in A. U.): Glutaric acid, 4.60 × 10^{-5}, 5.34 × 10^{-6}, 9.22; β-Me deriv., 5.77 × 10^{-5}, 6.28 × 10^{-7}, 2.27; β-Pr deriv., 4.97 × 10^{-5}, 4.32 × 10^{-7}, 2.12; β,β-di-Me deriv., 2.03 × 10^{-4}, 5.51 × 10^{-7}, 1.57; β,β-di-Et deriv., 3.40 × 10^{-4}, 7.85 × 10^{-8}, 1.02, β,β-di-Pr deriv., 2.03 × 10^{-4}, 5.42 × 10^{-8}, 1.01; cyclopentane-1,1-diacetic acid, 1.68 × 10^{-4}, 2.63 × 10^{-7}, 1.40; cyclohexane-1,1-diacetic acid, 3.36 × 10^{-4}, 1.02 × 10^{-7}, 1.04; cycloheptane-1,1-diacetic acid, 2.78 × 10^{-4}, 1.09 × 10^{-7}, 1.10. It is surprising that the value for r for glutaric acid is so very much greater than for any of the substituted acids, but this is in keeping with the conception that the normal dibasic acids tend to a straight (zig-zag) and not a coiled configuration; otherwise the data are in general agreement with the valency-deflection hypothesis in regards to both the sequence of the compds. and the relative magnitude of the differences in respect of the property under discussion. C. J. WEST

Decomposition of the six-carbon chain of adipic acid. II. JULIUS V. BRAUN, FRITZ JOSTES AND HANS WAGNER. Univ. Frankfurt a. M. *Ber.* **61B**, 1423–31(1928); cf. *C. A.* **21**, 60; Fuson, *C. A.* **22**, 2144.—F. reports that $NHEt_2$ and its homologs with $(CH_2CHBrCO_2Et)_2$ (I) gives, along with $AcCO_2Et$, $Et_2NCH_2CH_2CO_2Et$ (II) and not $MeCH(NEt_2)CO_2Et$ (III), as v. B. and his co-workers believed. Their belief was based on the fact that the alc. (IV) formed by reduction of the substance was different from the $Et_2NCH_2CH_2CH_2OH$ (V), which had been obtained 12 yrs. before from Et_2NH and $BrCH_2CH_2CH_2OBz$ and subsequent sapon of the resulting $Et_2NCH_2CH_2CH_2OBz$; the IV and V boiled at very nearly the same temp., to be sure, but IV gave an only slightly hygroscopic methiodide, m. 188°, while V yielded a quite hygroscopic methiodide, m. 174°. Having occasion recently to prep. some of the latter methiodide, the authors found that the old prepn. must still have been somewhat impure, for 2 more crystns. raised the m. p. to 188° and the hygroscopicity diminished somewhat. Again, III gives a methiodide which, contrary to Fuson, is not oily but m. 70° and depresses the m. p. (80°) of the methiodide of the ester (II) obtained from I about 50°, and the methiodide, m. 263°, of $MeCH(NEt_2)CH_2OH$ (obtained from III) materially lowers

the m. p. of the methiodide m. 188° obtained in either of the 2 ways described above. The authors now therefore agree completely with Fuson as to the course of the decompn. of I, but while F. believes that the detg. factor is the tendency to the formation of a 4-C ring, the authors still think that it is the form of the amine reacting with the I. This conclusion was based on a comparison of the behavior of Me_2NH and piperidine on the one hand and of Et_2NH and copellidine on the other; the more disk-like form of the first 2 bases allows them to substitute both Br atoms (spatially near to each other) in I, while the branched, more 3-dimensional form of the last 2 bases either prevents or represses such a substitution; if one Br atom is substituted, there is started a transition reaction which results either in the formation of a 4-membered ring, which decomps. further, or of a double bond, which persists. The formation of a double bond with β-methyladipic acid had already been shown to be very probable and a very careful study of I has now shown that a very small quantity of the compd. $EtO_2CCH(NEt_2)$-CH_2CH:$CHCO_2Et$ is formed in this case too. A study was then made of bases which may be considered as intermediate between those given above. Below are given the no of mols. of basic propionic ester per 100 mols. of diaminoadipic ester formed by I with various amines: Me_2NH 0, MeNHEt 10, MeNHPr 20, $MeNHCHMe_2$ 200, Et_2NH 1600, $(RCH_2CH_2)_2NH$ > 1600, piperidine 0, β-methylpiperidine 200, α-methylpiperidine 570, decahydroquinoline 520, α-methyl-β'-ethylpiperidine 500. These values show clearly that it is the progressive alkylation of the α-C atoms to the N and not of the more distant atoms which is of the greatest influence on the tendency of the bases to produce decompn. III, b_{13} 69–71°, gives with Na and alc. 40% of the alc., b_{13} 56–8°. *Me β-[methylethylamino]propionate*, b_{13} 75–80°, and impure *di-Et α,α'-bis[methylethylamino]adipate*, b_{13} 160–5° (found C 59.95, H 9.50%), are obtained in the ratio 1:20 from I and MeNHEt. MeNHPr, b. 61–2°, is obtained almost quant. from $PhSO_2NHMe$ and PrI and subsequent hydrolysis with concd. HCl at 160° of the resulting $PhSO_2NMePr$, b_{13} 182–3°, which is obtained in 80% yield; HCl salt, hygroscopic, m. 150°; *phenylurea*, m. 95°. With I it gives 5 parts *Et β-[methylpropylamino]-propionate*, b_{13} 83–5° (*HCl salt*, hygroscopic, m. 111–2°; *picrate*, m. 75–7°), and 36 parts of the impure diaminoadipate. *N-Isopropylbenzenesulfonamide*, b_{13} 190°; *methylisopropylbenzenesulfonamide*, b_{13} 175° (yield, 85%). *Methylisopropylamine*, b. 50°, d_4^{19} 0.7026; picrate, m. 135°; chloroplatinate, m. 185–9°; *HCl salt*, hygroscopic, m. 77°; *Ac deriv.*, b_{13} 69–70°; *Bz deriv.*, b_{12} 144°; *phenylurea*, m. 131°; *phenylthiourea*, m. 120°. With I it yields about equal parts of *Et β-[methylisopropylamino]propionate*, b_{13} 84–6° (*picrate*, m. 85–6°), and impure diaminoadipate. β-Pipecoline, b. 125° (Bz deriv., m. 44–5°; CdI_2 compd., m. 144°), gives with I about equal parts of *Et β-β'-pipecolylpropionate*, b_{13} 111–2° (*HCl salt*, m. 167–9°; *picrate*, m. 98–9°), and *di-Et α,α'-di-β'-pipecolyladipate*, m 61–3°, mol. wt. in camphor 388 (*HCl salt*, m. 191°; *picrate*, m. 196°). α-Pipecoline gives relatively more (about 75% of the total product) of the *Et β-α'-pipecolylpropionate*, b_{14} 117–9°; *picrate*, m. 123°. *trans*-Decahydroquinoline gives about 3 parts *Et β-[decahydroquinolyl]propionate*, faintly yellow, b_{13} 155–6° (*HCl salt*, m. 165–7°; *picrate*, m. 102°), and 25% pure *di-Et α,α'-di[decahydroquinolyl]adipate*, b_{13} about 220°, m. 107–8°. C. A. R.

The influence of solvent upon the optical rotation of diethyl tartrate. T. J. HEBERT AND J. N. PEARCE. State U. of Ia. *Proc. Iowa Acad. Sci.* **34**, 218–9(1927).—Detn., of the [α] of di-Et tartrate in various mixed solvents have been made at 25° and 30°, with 2 different concns. of the ester. The solvents used were EtOH, MeOH, C_6H_6 and PhMe and the binary mixts. of each solvent with each of the remaining solvents. The mixed solvents were made on a mol. fraction basis. The [α] was found to be dependent on the compn. of the mixed solvent, upon the concn. of the ester and upon the temp. It was also found to be influenced by the nature and proportions of the 2 solvents forming the binary mixt. W. G. GAESSLER

Composition and structure of the polymer of hydrocyanic acid. E. GRYSZKIEWICZ-TROCHIMOWSKI *Roczniki Chem.* **8**, 165–74(1928); cf. *C. A.* **17**, 1424; **18**, 1985; *Bull. soc. chim.* **35**, 366(1924).—The formula of a *4,5-dicyano-1,2,3-triazole* proposed for the polymer (I) by G. is made probable by Bedel's finding that I is $C_4H_4N_4$. It was confirmed by condensation with glyoxylic acid. When prepd. by polymerization of an aq. (90%) HCN with 10% aq. NH_3 at the b. p. the product is black and the yield very small. A brown product with a yield of 20–5% is obtained by using anhyd. HCN contg. 0.5% KCN at room temp. The crystals are easily sepd. from amorphous matter by extn. with boiling ether or cold acetone. The acetone ext. is evapd. at room temp. since it reacts on heating. I recrystd. from water or aq. MeOH with bone coal, is almost colorless, m. 180° (decompn.). Ten g. powd. I was added to 5.5 g. polyglyoxal in 50 cc. hot water. The dark cryst. reaction product seps. instantaneously. Yield 80%. Recrystd.

from alc. or water, then from benzene, it m. 132.5°. The mol. wt. (ebullioscopic) is 131.0, which points to $C_6N_4H_2$. It yields on sapon. of 2 g. with 3 g. NaOH in 10 cc. 50% alc., neutralization with HNO_3, pptn. with $AgNO_3$ and liberation with HCl 1.2 g. *pyrazine-2,3-dicarboxylic acid*, m. 182–5° (decompn.). It is therefore *2,3-dicyanopyrazine*, and I is accordingly *cis-dicyanodiaminoethylene* or *diaminomaleic dinitrile*. The sapon. of I probably first leads to $HO(NH_2)C:C(NH_2)CN$ and in the second stage to NH_2CO_2H and $NCCH_2NH_2$ which finally are decompd. to CO_2, NH_3 and glycine. The polymerization probably takes place over the dimer, *diiminoethylene*. M. J.

Cyano compounds of the platinum metals. IV. Cyano-oxo salts of osmium. F. Krauss and G. Schrader. Tech. Hochschule Braunschweig. *J. prakt. Chem.* **120**, 36–40(1928).—A satd. soln. of OsO_4 in H_2O and 10% KCN give an orange soln. (I) in which the Os is 6-valent. I, acidified with H_2SO_4, boiled to destroy the excess KCN and treated with 10% $CuSO_4$, gives the grayish cryst. $Cu[OsO_2(CN)_4]$, not decompd. by acids; concd. NH_4OH gives $[Cu(NH_3)_4][OsO_2(CN)_4]$, black needles, which gives off NH_3 in the air. I, acidified with HNO_3 and treated with $AgNO_3$, gives the *compd.*, $Ag_2[OsO_2(CN)_4]$, yellow, which gives with NH_4OH the *compd.* $[Ag_2(NH_3)_4][OsO_2(CN)_4]$, dark reddish brown needles, slowly gives off NH_3 in the air. C. J. West

Tetrathiocyanogen dichloride and several compounds of the thiodiazole series derived therefrom. E. Soderback. Univ. Upsala. *Ann.* **465**, 184–210(1928).—$(SCN)_2$ and HCl in Et_2O give an immediate ppt. of $(SCN)_2.2HCl$; after 2 days this is filtered off and the Et_2O distd. off, giving *tetrathiocyanogen dichloride* (I), $S_4C_4N_4Cl_2$, m. 69–70°; this also results in C_6H_6 but the yield is much smaller than in Et_2O. HBr and I give $(SCN)_2.2HBr$. Hg and I, shaken 4 days in Et_2O, give the *compd.* $Hg[(SCN)_2Cl]_2$, m. 168–9° (yield, almost quant.). With Na_2S in H_2O this gives the *compd.* $Na(SCN)_2Cl$(II), which crysts. with 2 H_2O; the aq. soln. with a slight excess of $CuSO_4$ gives the corresponding *cupro compd.*, pure yellow. A soln. of II gradually decomps., giving the *compd.* $(SCN)_n$, decomps. above 300°. From an excess of Na_2S with the Hg compd., there results *Na persulfocyanate*, $Na_2S(SCN)_2$, which crysts. with 5 H_2O. A soln. of II, heated with NaOH, gives *Na hydroxydithiocyanate* (III), crystg. with 4 H_2O, m. 108° (decompn.); *Pb salt*, pale yellow. III, decompd. with dil. HCl (with cooling), gives *thiocyanogen hydrate*, $(SCN)_2H_2O$. Shaking III with I in 92% EtOH gives *Na dihydroxytetrathiocyanate*, $Na_2O_2(SCN)_4.5H_2O$, prisms; 4 mols. H_2O are readily lost over concd. H_2SO_4 in a vacuum. Dil. H_2SO_4 gives the free *dihydroxytetrathiocyanic acid*, decomps. above 160°. *Hydroxytetrathiocyanic acid*, yellowish white; the *Na salt* crysts. with 7 H_2O. C. J. West

Nitric oxide and carbon monoxide compounds of apparently univalent iron and nickel. Hans Reihlen, Adolf v. Friedolsheim and Walter Oswald. Tech. Hochschule Karlsruhe. *Ann.* **465**, 72–96(1928); cf. Manchot *C. A.* **21**, 869; **22**, 1134.—The original should be consulted for the 18 pages of discussion of the results. EtSH (4.8 g.) in 20 cc. 6 *N* KOH, shaken with NO, gives 95% of Et_2S, N_2O and H_2O also being formed. Ni_2SO_4 (10.85 g.) in 100 cc. H_2O and 4.8 g. EtSH in 12.9 cc. 6 *N* KOH, shaken with NO, give 84% of the *compd.*, $40NiNOSEt + Ni(SEt)_2 + 6H_2O$; a parallel expt. gave a less pure compd., $14NiNOSEt + Ni(OH)_2 + 7H_2O$. In AcOH there resulted the compd. $7NiNOSEt + Ni(SEt)_2 + 2.5H_2O$; in an alk. soln. with excess EtSH, approx. the same compd. is formed. A slightly alk. suspension of $Fe(OH)_2$ and EtSH, treated with a lively stream of CO, gives *bis[ethyl mercaptoiron carbonyl]*, $Fe_2(SEt)_2(CO)_6$, m. 67°; the mol. wt. indicates the bimol. form. C. J. West

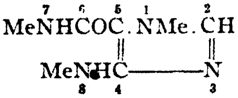
Hydrolysis of guanidine carbonate. James Bell. Trinity College, Dublin. *J. Chem. Soc.* **1928**, 2074–7; cf. *C. A.* **20**, 2825.—A 0.1 *N* soln. of guanidine carbonate (I) was unchanged after remaining for 10 weeks at room temp. When boiled under reflux, hydrolysis took place to an appreciable extent; $CO(NH_2)_2$ was first formed and then decompn. to $(NH_4)_2CO_3$ took place to a lesser degree; no cyanate could be detected among the products of this hydrolysis. The rate of hydrolysis diminishes very much after 3 hrs.' boiling and the reaction appears to stop after 12 hrs., because of the accumulation of $(NH_4)_2CO_3$ in the soln. The hydrolysis of I in H_2O is due to its dissociation into free guanidine and H_2CO_3, the free base being hydrolyzed in the manner already described. Salts, such as the chloride, which undergo no such dissociation in H_2O, remain unchanged on boiling. C. J. West

The preparation of derivatives of guanidine from *S*-methylisothiourea sulfate. Vittorio Piovano. Istituto Naz. Med. Farm. Serono, Roma. *Gazz. chim. ital.* **58**, 245–9 (1928).—The synthetic method described is of general application, and is of advantage in that (1) guanidine derivs. are obtained directly without the necessity of eliminating secondary products; (2) there is a min. consumption of the amino compd., and (3) the use of a sealed tube is avoided. $[H_2NC(:NH)SMe]_2H_2SO_4$ (I) (10 g.) (cf. Arndt, *Ber.* **54**, 2236) in a min. of water treated with $PrNH_2$ (4.20 g.), after some hrs. heated slowly

to boiling until MeSH is no longer evolved, cooled, and the ppt. dissolved in water and pptd. by EtOH, yields 9 g. (70%) of *propylguanidine sulfate*, $[H_2NC(:NH)NHPr]_2.H_2SO_4$ (II), m. 220° (decompn.). BaO (5 g.) added to II (4 g.) in a little water to remove all H_2SO_4 but not to leave excess Ba and filtered, gives a soln. from which were prepd. 3 *propylguanidine salts: picrate*, $C_4H_{11}N_3.C_6H_3O_7N_3$, golden yellow, m. 177–8°; *chloroaurate*, $C_4H_{11}N_3.HAuCl_4$, bright red, unstable in air, m. 200° (decompn.), and *chloroplatinate*, $(C_4H_{11}N_3)_2H_2PtCl_6$, golden yellow, m. 195° (decompn.). *Piperazine* (3.20 g.) added to I (10 g.) in a min. of water, boiled until MeSH is no longer evolved, cooled and the ppt. recrystd., yields *piperazineguanidine sulfate*, $[H_2NC(:NH)N(CH_2CH_2)_2NC(:NH)NH_2]H_2SO_4$, m. 288–90° (decompn.). By treating this (10 g.) in water with BaO (5.69 g.), a soln. was obtained from which were prepd. the following 3 *piperazineguanidine salts: picrate*, $C_6H_{14}N_6(C_6H_3N_3O_7)_2$, from alc. picric acid, lemon-yellow, m. 260–70° (decompn.); *chloroaurate*, $C_6H_{14}N_6(HAuCl_4)_2$, from concd. $AuCl_3$ acidified with HCl, greenish yellow, birefringent, turns brown in air, m 243° (decompn.) and *chloroplatinate*, $C_6H_{14}N_6.H_2PtCl_6$, lemon-yellow, m. 265–8° (decompn.). C. C. Davis

Caffeidine and caffeidinecarboxylic acid. Heinrich Biltz and Hans Rakett. Univ. Breslau. *Ber.* **61B**, 1409–22(1928).—Caffeine with alkalies takes up 1 mol. H_2O to form caffeidinecarboxylic acid (I), which by loss of CO_2 gives caffeidine; this, from its monobasic character and its reactions must have the structure **II.** Whether in the formation of I the purine ring is broken between positions 1 and 2 or 2 and 3 was not known but the present work shows that it is between 1 and 2 and hence that I has the structure III. In its prepn. 2 *N* NaOH in moderate excess was used instead of $Ba(OH)_2$ and heating was avoided; by shaking with a machine, the time necessary for the reaction was reduced from more than 2 weeks to 3-4 days. From the cooled soln. the II can be pptd. directly with HNO_3 as the difficultly sol. nitrate (hitherto described as a hygroscopic substance), and from the mother liquors the I is obtained as the Cu salt by the original May and Andreasch method. II behaves as a monoacid base (with HCl, HI, HNO_3, $HClO_4$, H_2PtCl_6). With H_2SO_4 it forms a 1:1 salt, to be sure, but this is undoubtedly an acid salt. Since caffeine is monoacid through the 9-N atom and the imidazole ring of II is the same as that in caffeine, the basic nature of II is probably due to the same N atom (3 in the notation for II). The MeNH group on C atom 4 is apparently not capable of adding acids, probably because of the adjacent 4,5-double bond. In agreement with this view is the fact that I, whose 8-N atom certainly does not add acids, forms with acids salts like caffeine and II. II also forms a *complex Ag salt* $[Ag(C_7H_{12}ON_4)_2NO_3]$ with $AgNO_3$. The action of HNO_2 on II shows that the 8-N atom is secondary. The 7-MeNH group does not react with HNO_2, for *allo*-caffuric acid can in no way be nitrosated. Since I does not react with HNO_2, the CO_2H group must be on N atom 8, as shown in formula III. Similarly II can and I cannot be benzoylated. The 1st Me group which can be introduced with MeI certainly enters the same position; the 2nd Me group, which can be likewise introduced with MeI, may enter position 7 but this is not proved. Me_2SO_4 introduces only one Me group. The smooth transformation of II into 1,3-dimethylparabanic acid does not seem to harmonize with the structure given for II; it would appear to indicate that II contains a ring with two NMe groups. The explanation is doubtless that the reaction is complicated; the II splits open between positions 2 and 3, a CO_2H group is produced at 2, and this with the NHMe group at 8 forms the new ring of the parabanic acid, the N atoms at 3 and 7 being split off by oxidation at the same time. The presence of the 4,5-double bond in II can be shown by means of Cl in MeOH and H_2O; in MeOH is obtained *caffeidine-4,5-glycol di-Me ether* (IV), while with Cl water the II likewise adds two HO groups at the double bond but at the same time oxidation occurs at 2 and the MeNHCO group at 6 is split off, the product being *1-methyl-2-keto-4-methylaminotetrahydroimidazole-4,5-glycol* (V). II can be converted back to caffeine, with 50% yield, with $ClCO_2Et$ or KOCN, and, through the amide of I, into theobromine. With $CSCl_2$ is obtained a *2-thiocaffeine* (VI), which can be converted in $CHCl_3$ into the *8-Cl deriv.* (VII), and this with NaOMe gives the *8-MeO compd.* (VIII), which can be rearranged into *2-thiotetramethyluric acid* (IX) or converted with HCl into *1,3,7-trimethyl-2-thiouric acid* (X). Finally VII was converted into *1,3,7-trimethyl-2,8-dithiouric acid* (XI) and, by alkylation, into various ethers of *2-thio-8-thiocaffeine* (XII). Nitrate of II (yield, 41%), m. 215° (decompn.), soly. in boiling H_2O about 50, H_2O at room temp. about 2, boiling MeOH about 2.7, boiling AcOH about 15 (with decompn.). II, as detd. by J. Pohl, has no diuretic action and does not affect the blood pressure. *Perchlorate*, m. 220–1° (decompn.), soly. in boiling MeOH and EtOH about 8.6; *HCl salt*, m. 215° (decompn.), is not deliquescent when pure. *Bz deriv.*, m. 174°, decompd. by alkalies, stable towards dil. acids, forms no

salts with acids. *NO deriv.*, m. 155° (effervescence), quite stable towards even concd. NaOH at room temp., forms no salts with acids. *Methylcaffeidine* (3.5 g. from 5 g. II.HNO_3 and alk. Me_2SO_4), m. 86°; *perchlorate*, m. 173°, soly. in MeOH at room temp. 1.8, at the b. p. about 8. IV.*HCl* (2.5 g. from 5 g. II in cold dry alc. with Cl); free IV, m. 164°. V.*HCl*, crystals with 1 H_2O, m. 112°, belonging (according to J. Valeton) to the monoclinic holohedral class, β 116° 17′, $a:b:c$ = 1.074:1:1.480, gives $(CO_2H)_2$ when dissolved in boiling 2 *N* NaOH and then boiled a short time with AcOH. Free V, prepd. from the HCl salt with KOCN (but not with NaOH, Na_2CO_3, $Ba(OH)_2$, $PbCO_3$ or Ag_2O), m. 163° (effervescence), soly. in alc. at room temp. about 0.3, at the b. p. 1. *Amide* of I, from II and urea with HCl gas at 135–40°, m. 244–5°, gives theobromine on long boiling in mineral acids or AcOH, evapn. with concd. HCl, boiling with Na_2CO_3 and acidifying with AcOH, treating with HCl gas in alc. or heating above its m. p. VI (20–2 g. from 25 g. II. HNO_3), light yellow, sinters 203°, m. 205°, sol. in concd. mineral acids but repptd. on diln., much more bitter than caffeine and has a strong diuretic action; *perchlorate*, deflagrates on Pt, m. 239–40° (decompn.), hydrolyzed by boiling H_2O or alc. VII (6–7 g. from 8.6 g. VI), yellow, m. 186–7°, easily sol. in concd. acids. VIII (1.5–1.7 g. from 2 g. VII), m. 174°, soly. in boiling alc. about 25. IX, from VIII in MeOH at 200°, darkens 260°, m. 297–8°. X, m. 343°, apparently with decompn., sol. in alkalies and concd. mineral acids. XI (2.5 g. from 3 g. VII with boiling aq. KSH), yellow, m. 285°, soly. in boiling H_2O about 0.8, easily sol. in alkalies and repptd. by acids; *Na* and *K salts*, yellow. *Me ether* of XII (0.8 g. from 1 g. XI with alk. Me_2SO_4), m. 183°, soly. in alc. about 5. *Et ether* (0.9 g. from 1 g. XI with EtBr and KOH), light yellow, m. 156°. *Allyl ether*, yellow, m. 98°. I m. 159° (decompn.); AcOH compd., m. 127–9°; *nitrate*, m. 173° (effervescence); *perchlorate*, m. 167–8° (effervescence); *HCl salt*, m. 179° (decompn.).



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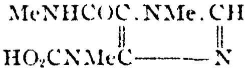


(III)

C. A. R.

Hydroxypropyltheobromine. St. Weil and St. Rozenblum(owna). *Roczniki Chem.* **8**, 175–6(1928); *Bull. pharm. inst. Poland* No. **2**, 175–6.—*sym-Ditheobromine isopropanol*, $(RCH_2)_2CHOH$, was obtained by heating 2 mols. Na theobromine with 1 of dichlorohydrin to 130°, extn. of the white compd. with dild. NaOH and washing with H_2O. It is insol. in water and org. acids, sol. in mineral acids. In a dog of 4.5 kg. 1 g. caused marked diuresis with no untoward effects. Clinical expts. showed that the diuretic effect was not greater than that of diuretin. Mary Jacobsen

Alkali cleavage of pentoses. F. Fischler and R. Boettner. Univ. Munich. *Z. physiol. Chem.* **177**, 264–9(1928).—Distn. of 1% arabinose or xylose during the gradual addn. of a soln. contg. 0.04 *M* Na_2CO_3 and 4.6% Na_2SO_4 yields a neutral distillate which gives the CHI_3 test and reacts with Schiff's reagent. Treatment of the distillate with $PhNHNH_2$ gives a mixt. of osazones which may be sepd. by gradually dilg. the EtOH soln. At a concn. of 70.5% EtOH glycolaldehyde osazone, m. 179°, seps., and at 40–5% EtOH methylglyoxal osazone, m. 145°, seps. Just as hexoses on distn. with alkali break into two 3-C chains (*C. A.* **20**, 3722), so pentoses break into one 3-C and one 2-C chain. No CH_2O, AcH or MeAc could be detected. Although the 2 products should be obtained in equal mol. proportions, the distillate contains a greater amt. of the AcCHO because of its greater volatility. The cleavage indicates a γ-oxide structure for the pentoses. The reaction probably consists first in the formation of Na arabinosate, which immediately breaks down into glyceraldehyde and glycolaldehyde. The former easily rearranges into $CO(CH_2OH)_2$, which on distn. is converted into AcCHO. A. W. Dox

The percentage formula of pentosans. Gerhard Schorsch. *Papierfabr.* **25**, *Tech.-Wiss. Teil* 576–7(1927).—The formula $(C_{10}H_{18}O_9)_n$ is advanced for pentosans based on the following evidence: (1) They never yield 100% xylan, for instance, when detd. as the furfuralphloroglucide; (2) the purest prepns. available yielded only 92.6% pentosan; and (3) no sugar other than a pentose has ever been isolated from a pentosan. The formula $2C_5H_{10}O_5 - H_2O = C_{10}H_{18}O_9$ is in accord with the exptl. results.

J. L. Parsons

Diglucosyl tetrasulfide. Fritz Wrede and Otto Hettche. Univ. Greifswald. *Z. physiol. Chem.* **177**, 298–300(1928).—Sulfides and disulfides of sugars have already been prepd. by the action of K_2S and K_2S_2 on acetobromo-sugars (*C. A.* **14**, 1546).

The octaacetate of dithioglucosyl tetrasulfide, m. 208°, $[\alpha]^{20}_D$ −306°, has now been obtained by treating tetraacetylthioglucose (I) in dry Et_2O with excess of S_2Cl_2. The reaction mixt. solidifies to a cryst. mass which can best be recrystd. by dissolving in cold $CHCl_3$ and adding a large vol. of MeOH or petroleum ether. It is practically insol. in cold EtOH, Et_2O, C_6H_6 or H_2O and is gradually decompd. by hot EtOH. The usual method of removing Ac by treatment with MeOH-NH_3 at 0° decomps. it into octaacetyldiglucosyl disulfide and S. Similar condensations of I with SCl_2 and Se_2Cl_2 were unsuccessful. A. W. Dox

Reactivity of the methylated sugars. III. The action of dilute alkali on tetramethyl-*d*-mannose. Richard D. Greene and W. Lee Lewis. Northwestern Univ. *J. Am. Chem. Soc.* **50**, 2813 25(1928).—Directions are given for the prepn. of cryst. tetramethyl-*d*-mannose, m. 50.5–1.5°, $[\alpha]^{20}_D$ 2.4° (H_2O), 27.6° (MeOH), 23.0° ($CHCl_3$) (*c* 5 in all cases). A *M* mannose soln. in 0.342 *N* $Ca(OH)_2$, allowed to stand at 35° for 200 hrs. changed in rotation from 14.3 to 0.6° and the equil. mixt. contained mannose 71.7, glucose 8.9 and fructose 16.9% with 2.5% of non-sugar substances (probably saccharinic acids). On treating 100 g. tetramethylmannose with dil. alkali, 93.5 g. of sugar was recovered, which yielded a wt. of cryst. anilides equiv. to 87.8 g. of sugar; the wt. of pure anilides sepd. from this was equiv. to 74.7 g. of sugar, of which 36.9 g. was tetramethylglucose and 37.8 g. was tetramethylmannose; no methylated ketose was formed. Evidence is presented for the presence of the monomethyl ene-diol common to tetramethylmannose and tetramethylglucose. The ring structures of the normal forms of these 2 sugars are indicated to be identical. The prediction of the ene-diol theory as applied to the action of dil. alkali upon tetramethylmannose has been confirmed. C. J. West

Synthesis of sugars. VIII. Burckhardt Helferich and Hellmut Bredereck. Univ. Greifswald. *Ann.* **465**, 166–84(1928); cf. *C. A.* **21**, 2879.—*Vicianose.*—1,2,3,4-Tetraacetylglucose (23 g.) and 10.4 g. acetobromoarabinose in 80 cc. $CHCl_3$, shaken with 10.4 g. Ag_2O, give 0.7 g. *heptaacetyl-6-β-l-arabinosido-d-glucose*, m. 158–60°, $[\alpha]^{14}_D$ 7.5° ($CHCl_3$); sapon. with MeONa gives *6-β-l-arabinosido-d-glucose*, sinters 190°, m. 210° (decompn.), $[\alpha]^{14}_D$ 56.6° (10 min. after soln.), 40.5° (after 1 hr. in H_2O); this is assumed to be identical with vicianose (Bertrand, *Compt. rend.* **143**, 832(1906)) *Melibiose.* *Tetraacetyl-α-phenol-d-galactoside*, m. 131–2°, $[\alpha]^{20}_D$ 173.3° (C_6H_6), 175.5° ($CHCl_3$), results in 2.2 g. yield from 6 g. acetobromogalactose, 20 g. PhOH and 2.5 cc. quinoline. 1,2,3,4-Tetraacetyl-β-*d*-glucose (21 g.), 6.2 g. acetobromogalactose and 2.1 cc. quinoline, heated 1 hr. on the H_2O bath, give finally 0.025 g. *octaacetyl-6-α-d-galactosido-β-d-glucose* (octaacetylmelibiose), m. 172–3°, $[\alpha]^{20}_D$ 97.2° ($CHCl_3$). *Synthesis of an acetate of a cellobiosidogentiobiose.*—(With W. Schafer and K. Bauerlein.) Heptaacetyl 6-β-cellobiosidoacetobromoglucose (2.4 g.) and 4.8 g. 1,2,3,4,β-tetraacetyl *d*-glucose with Ag_2O in $CHCl_3$ give 0.45 g. of *6′-β-cellobiosido-β-gentiobiose tetradecaacetate*, m. 239–40°, $[\alpha]^{15}_D$ −19.6° ($CHCl_3$). *Heptaacetyl-6-β-cellobiosido-2,3,4-β-triacetylglucose*, m. 233°, $[\alpha]^{15}_D$ −6.6° ($CHCl_3$), results by shaking the Br deriv. with Ag_2O in Me_2CO. *A new tetraacetyl-d-fructose.*—(With Irmgard Modrow.) Fructose (100 g.) in 600 cc. abs. C_5H_5N and 160 g. Ph_3CCl gives 31 g. *triphenylmethylfructose*, m. 160–5° $[\alpha]^{15}_D$ −26.2° (C_5H_5N, 15 min. after soln.), changing to 4.2° after 75 hrs. Ac_2O gives the *tetra-Ac deriv.*, m. 146°, $[\alpha]^{20}_D$ 42.4° ($CHCl_3$). AcOH-HBr gives 30.7% of a *tetraacetyl-d fructose*, m. 112°, $[\alpha]^{18}_D$ 51.0° ($CHCl_3$); at 18° H_2O dissolves 2.5%, which soln. shows mutarotation The penta-Ac deriv. m. 68–70°, $[\alpha]^{18}_D$ 37.1° ($CHCl_3$). Acetobromoglucose and Ag_2O give *octaacetyl-β-d-glucosidofructose*, m. 129°, $[\alpha]^{20}_D$ 14.1° ($CHCl_3$). C. J. West

Action of (quadrivalent) titanium chloride on sugar derivatives. I. New method for the preparation of α-acetochlorosugars and the rearrangement of β-methyl glucoside into its α-form. Jenö Pacsu. Univ. Budapest. *Ber.* **61B**, 1508–13(1928).—The rearrangement of β-glucosides and β-acetylsugars into their α-forms with $SnCl_4$ in abs. $CHCl_3$ recently reported on (*C. A.* **22**, 1332) is very slow at room temp. and if it is accelerated by heating slight decompn. occurs and the soln. becomes too dark for polariscopic readings. Other $CHCl_3$-sol. metal halides have accordingly been tried. $SiCl_4$ has practically no effect while $TiCl_4$ has a very powerful action which makes it possible to convert tetraacetyl-β-methylglucoside quant. and without decompn. into the α-form in 4–5 hrs. on the H_2O bath. The mechanism of the reaction is, however, apparently different than with $SnCl_4$. On adding the $TiCl_4$ the soln. does not remain clear but a lemon-yellow addn. product is formed, which is difficultly sol. in $CHCl_3$

and in great part seps. out as an amorphous ppt.; even on warming it only partially dissolves so that the course of the reaction cannot be followed polarimetrically as with $SnCl_4$. With the other sugar derivs. mentioned below, $TiCl_4$ likewise immediately forms yellow, orange to purple ppts., which, however, generally redissolve rapidly with distinct evolution of heat. These colored mol. compds. all decomp. immediately, with loss of color, on stirring with H_2O, the $TiCl_4$ remaining in the H_2O as titanic acid and the sugar deriv., completely colorless, in the $CHCl_3$. The much more energetic action of $TiCl_4$ as compared with $SnCl_4$ on the 1-C atom of the sugar derivs. is shown by its behavior with completely acetylated mono- and disaccharides. Whereas the influence of $SnCl_4$ is exhausted when the groups in the β-position on the 1-C atom have rotated after a time into the α-position and there is a quite insignificant formation of an α-acetochlorosugar by replacement of the 1-AcO group in the α-acetylsugar, $TiCl_4$ acts so energetically that the sole product is the α-acetochlorosugar. The action of $TiCl_4$ on β-acetylsugars differs from that of $SnCl_4$ in that here too there are at once formed strongly yellow halochromic compds. which, however, quickly redissolve. The rotation of the resulting clear yellow soln., *e. g.*, of β-pentaacetylmannose, is strongly shifted towards the right from the original *l*-rotation but this instantaneous change in rotation does not indicate an instantaneous rearrangement of the β- into the α-form; the new rotation value is that of the $TiCl_4$ addn. compd. since decompn. with H_2O yields the original β-deriv. unchanged. If, however, the soln. is allowed to stand a long time at room temp. or is gently refluxed 3–4 hrs. the *d*-rotation gradually increases to a max. and on working up the product the pure α-acetochlorosugar is now found in the $CHCl_3$ layer. This replacement of the 1-AcO group by Cl proceeds so smoothly in all the acetylated mono- and disaccharides studied that the reaction affords a new, very convenient method for the prepn. of α-acetochlorosugars. By means of it tetraacetyl-α-chloroglucose (I) and -mannose (II), heptaacetyl-α-chlorolactose (III) and *heptaacetyl-α-chlorogentiobiose* (IV) were obtained in cryst. form with 1 mol. $TiCl_4$ per mol. of acetylsugar. Pentaacetyl-β-salicin, $[\alpha]^{23}_D$ $-18.5°$, gives with $TiCl_4$ an orange-yellow ppt., which quickly redissolves on shaking, the orange-yellow soln. showing $[\alpha]$ 48°. At this point H_2O regenerates the unchanged β-salicin but on standing the rotation decreases (from 3.8° to 3.1° in 6 hrs.) and the color deepens (orange-red); after 24 hrs. the bordeaux-red soln. has a rotation of 2.48°, and after 4 days the soln. is almost black-red and the rotation can no longer be measured. H_2O completely discharges the color and the resulting clear $CHCl_3$ layer yields pure tetraacetyl-β-salicin chloride, m. 160°, $[\alpha]^{20}_D$ 12.02°; this same smooth replacement by Cl of the AcO group in the aglucone can be effected in 2–3 hrs. under a reflux. I (8.6 g. from 10 g. β-pentaacetylglucose), m. 73°, $[\alpha]^{20}_D$ 167.85° ($CHCl_3$). II (8 g. from 10 g. of the β-pentaacetate), m. 81°, $[\alpha]^{20}_D$ 90.58°. III (7.8 g. from 10 g. of the β-octaacetate), m. 122°, $[\alpha]^{20}_D$ 83.97°. IV, m. 142–3°, $[\alpha]^{20}_D$ 89.22°. C. A. R.

Synthesis of saccharides. HANUŠ VOGEL. *Listy Cukrovar.* **46**, 663–5(1928).—A review with special reference to the work of Pictet and Vogel. FRANK MARESH

The synthesis of natural disaccharides. HANUŠ VOGEL. *Listy Cukrovar.* **46**, 634–7(1928).—A review of the work of Pictet and co-workers. FRANK MARESH

Trimethylglucose. WILFRED H. LINNELL. *J. Pharm. Soc.* **1**, 200–9(1928).—This research was instituted in an attempt to throw further light on the constitution of 2,3,6-trimethyl-γ-methyl glucoside. Various expts. now appear to indicate definitely that the trimethylglucose obtained from sucrose is different from that prepd. from methylated cellulose and from methylated lactose. The product of this reaction was isolated in the usual way and obtained as a yellow viscid sirup which deposited white silky needles on standing. The latter m. 62–4°. Attempts to recrystallize failed because of extreme soly. in all org. solvents. Analysis proved the substance to be a trimethyl-β-methyl glucoside having $[\alpha]$ $-15.5°$. W. O. E.

Depolymerization of inulin. HANS VOGEL AND AMÉ PICTET. Univ. Geneva. *Helv. Chim. Acta* **11**, 215–20(1928); cf. *C. A.* **21**, 2665.—Com. inulin (10 g.) is depolymerized by heating for 3 hrs. at 120° and 15 mm. with 15 g. of glycerol. The product is dissolved in 200 cc. MeOH, filtered and by pptn. with 300 cc. of Et_2O, 9 g. of a yellow *trifructosan* (I) is obtained, m. 165°, sol. in H_2O and slightly sol. in MeOH and C_5H_5N, $[\alpha]^{21}_D$ -83.3. I does not reduce Fehling soln. nor give an osazone, but forms fructose (II) when heated with 5% H_2SO_4. By allowing 3 g. of I and 25 cc. of Ac_2O in 25 cc. of C_5H_5N to stand for 24 hrs. and pptg. with ice H_2O, a *nonaacetate*, $C_{18}H_{21}O_{15}(C_2H_3O)_9$, is obtained, m. 91°, insol. in H_2O, Et_2O and ligroin, sol. in hot MeOH and EtOH and very sol. in PhH and $CHCl_3$, $[\alpha]^{20}_D$ $-29.58°$. Heating inulin for 6 hrs. at 140° pro-

duces 51% of a *difructosan* (III), m. 96°, sol. in H_2O, MeOH and C_5H_5N, insol. in EtOH and Et_2O, $[\alpha]^{20}_D$ −24.5–24.8°. III reduces Fehling soln. and yields II by heating with H_2O. With 20 cc. of Ac_2O in 30 cc. of C_5H_5N, 2 g. of III forms a *hexaacetate*, m. 92°, insol. in cold EtOH and Et_2O, slightly sol. in hot H_2O, EtOH and AcOH, sol. n MeOH, $CHCl_3$ and PhH, $[\alpha]^{20}_D$ −29.8°. Evapn. of the mother liquor from II gives a sirup, $[\alpha]^{20}_D$ +12.9°, which appears to be a compd. of glycerol and a *monofructosan*, identical with the *levulosan* (IV) obtained by heating levulose *in vacuo* (*C. A.* **15**, 3462). Heating 9 g. of IV for 4 hrs. at 120° and 14 mm. with $ZnCl_2$ gives a *dilevulosan* (V), m. 138–40°, sol. in cold H_2O, insol. in EtOH, Et_2O and PhH, which reduces Fehling soln. and forms a hexaacetate, m. 83–4°, $[\alpha]^{20}_D$ +6.98°; hence III and V are not identical.

A. S. Carter

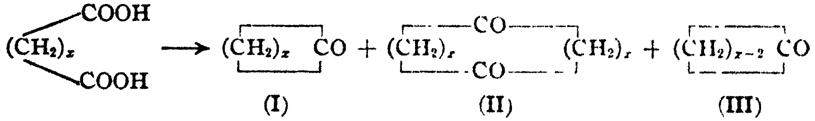
Syntheses of cyclic compounds. III. Reduction of some unsaturated cyano esters by moist aluminum amalgam. A new synthesis of mono-substituted malonic acids and of β,β,β′,β′-tetramethyladipic acid. Further evidence for the multiplanar configuration of the cycloheptane ring. Israel Vogel. Imperial Coll. Sci. Tech., London. *J. Chem. Soc.* **1928**, 2010–32; cf. *C. A.* **22**, 2369.—$Me_2C{:}C(CN)CO_2Et$, b_{14} 115°, m. 33°, reduced with moist Al-Hg, gives as the main product, $Me_2CHCH(CN)CO_2Et$, b_{16} 99°, d_4 0.9862, 0.9481 and 0.9261 at 19.2°, 62.4° and 86.8°, γ 31.49, 27.60, 25.32 for 23.3°, 61.8° and 86.6°, mean parachor, 374.8 (hydrolysis gives $Me_2CHCH(CO_2H)_2$, m. 87–8°), and *Et α,δ-dicyano-β,β,γ,γ-tetramethylbutane-α,δ-dicarboxylate*, viscid, reddish brown oil, the *amide* of which m. 95°; hydrolysis gives β,β,β′,β′-tetramethyladipic acid, m. 207°, a most convenient mode of prepg. this acid. Condensation of $Me_2C{:}C(CN)CO_2Et$ with KCN in EtOH and hydrolysis gives 60% of $HO_2CCH_2CMe_2CO_2H$, m. 141°; Et ester, b_{15} 101°, $d_4^{22.7}$ 0.9945, $n_D^{22.7}$ 1.4209. Cyclopentanone, $b_{761.5}$ 129.5°, $n_D^{16.0}$ 1.4383, d_4 0.9158, 0.9099, 0.8871 at 16.4°, 62.8°, 86.4°, γ 34.08, 29.04, 26.40 at 18°, 61.6° and 85.4°, mean parachor, 214.2. $(CH_2)_4C{:}C(CN)CO_2Et$ (I), on reduction with moist Al-Hg, gives as the main product *Et dl-cyclopentylcyanoacetate* (II), b_{13} 129°, d_4 1.0263, 0.9936, 0.9714 at 17.7°, 61.6° and 86.2°, γ 34.99, 30.87, 28.58 at 17.7°, 61.2° and 86.4°, mean parachor 430.1; a 2nd product consists of a very viscid, reddish brown oil, whose bimol. character was detd. by mol. wt. detns. in camphor; it appears to be a cyclic structure. Hydrolysis of II gives *cyclopentylmalonic acid*, m. 165° (decompn.). Condensation of I with EtOH-KCN, followed by hydrolysis, gives $C_4H_8C(CH_2CO_2H)CO_2H$, m. 160° (81% yield); the *anhydride* b_{13} 135–7°, m. 32°; the *anilic acid* m. 169°, decomps. 170°. The *Et ester* b_{13} 129°, $d_4^{20.2}$ 1.0412, $n_D^{20.2}$ 1.4477. Cyclohexanone, b_{15} 47°, d_4 0.9492, 0.9116, 0.8902 at 15.7°, 61.8° and 86°, γ 34.81, 29.84 and 2711 at 17.3°, 61.6° and 86.4°. Reduction of $(CH_2)_5C{:}C(CN)CO_2Et$ (100 g.) gives 85 g. of *Et dl-cyclohexylcyanoacetate*, b_{14} 145°, d_4 1.0221, 0.9901, 0.9690 at 18.5°, 61.2° and 86.4°, γ 35.84, 31.60, 29.36 at 17.3°, 61.8° and 85.6°, $n_D^{18.5}$ 1.4612 (hydrolysis gives $(CH_2)_5CH(CO_2H)_2$); there also results 6 g. of the *dicyano ester*, $C_{22}H_{32}O_4N_2$, m. 87°. Cycloheptanone, b_{10} 71°, d_4 0.9507, 0.9160, 0.8954 at 18.6°, 61.7°, 86.8°, γ 35.38, 30.80, 27.96 at 19.9°, 61.6° and 86.4°, mean parachor, 288; condensation with $NCCH_2CO_2Et$ gives 31% of *Et cycloheptylidenecyanoacetate*, b_{12} 160°, d_4 1.0564, 1.0219, 1.0037 at 16.3°, 61.6° and 85.6°, γ 37.70, 33.60, 31.37 at 18.6°, 62.0° and 85.4°, $n_D^{13.6}$ 1.5003; reduction gives a small amt. of the *dicyano ester*, $C_{24}H_{36}O_4N_2$, m. 74°, and, as the principal product, *Et dl-cycloheptylcyanoacetate*, b_{11} 149°, d_4 1.0209, 0.9898, 0.9704 at 19.7°, 61.8° and 86.6°, γ 35.96, 32.05 and 29.74 at 21.3°, 61.8° and 86.0°, n_D^{19} 1.4664; hydrolysis gives *cycloheptylmalonic acid*, m. 164.5° (decompn.). $(CH_2)_6C(CO_2H)CH_2CO_2H$, m. 159°, yields an *anhydride*, b_{13} 166°, m. 16° and an *anilic acid*, m. 159°, decomps. 160°. *trans*-β-Decalone, b_{12} 106°, d_4 0.9802, 0.9493, 0.9331 at 17.9°, 62.2° and 85.3°, γ 36.64, 32.45, 30.38 at 19.3°, 61.8° and 85.1°; *Et trans-decahydro-β-naphthylidenecyanoacetate*, b_{14} 197°, d_4 1.0523, 1.0239, 1.0091 at 19.4°, 62.3° and 85.0°, γ 37.37, 33.94, 32.07 at 21.6°, 61.8° and 850°, $n_D^{19.4}$ 1.5108; reduction gives principally *Et trans-dl-decahydro β-naphthylcyanoacetate*, b_{12} 186°, d_4 1.0302, 1.0011, 0.9861 at 19.9°, 62.2° and 84.8°, γ 36.32, 32.81 and 30.76 at 20.1°, 60.8° and 84.1°, $n_D^{19.3}$ 1.4805. Hydrolysis gives *trans-decahydro-β-naphthylmalonic acid*, m. 122° (decompn.). Et benzylidenemalonate, b_{14} 196°, d_4 1.1049 (supercooled), 1.0708, 1.0528 at 18.5°, 61.4° and 84°, γ 38.70, 34.42, 32.17 at 19.8°, 61.2° and 84.3°. Et benzylmalonate, b_{14} 163°, d_4 1.0761, 1.0433, 1.0231 at 19.7°, 61.2° and 85.0°, γ 35.54, 31.39 and 29.18 at 20.5°, 61.2° and 83.5°. **IV. The catalytic decomposition of suberic acid and the preparation of suberone directly from mixtures of suberic and azelaic acids.** *Ibid* **2032–5**.—Heating an intimate mixt. of 100 g. suberic acid, 100 g. Fe filings and 5 g.

of finely powd. crystd. $Ba(OH)_2$ at 280–90° gives 40% of suberone. The mixt. of azelaic and suberic acids obtained by the oxidation of ricinoleic acid with HNO_3 also gives a good yield of suberone, together with a relatively small amt. of a liquid the exact compn. of which has not been elucidated. C. J. West

Δ^3-Cyclohexenol. S. Sabetay and L. Palfray. Houbigant Lab., Puteaux, Seine. *Bull. soc. chim.* **43,** 906–9(1928); cf. *C. A.* **19,** 1857.—Δ^3-Cyclohexanol (I) was prepd. by heating 27 g. of 4-chlorocyclohexanol (II) with 5 g. Na wire in dry Et_2O for 2 days, removing the Et_2O and fractionating the liquid. I is a rather viscous oil with a bitter, burning taste, b_{14} 67–8°, n_D^{20} 1.4627, d_{20} 0.9425; phenylurethan, m. 82° (cf. Baeyer, *Ann.* **278,** 97(1893)). By passing HCl into a mixt. of trioxymethylene and **II,** there was obtained the *chloromethyl ether* of II, b_{15} 117.5°, n_D^{20} 1.4942. *Et ether* of **II,** b_{16} 84–5°, n_D^{20} 1.4622, d_{20} 1.028. II, left in contact with powd. KOH in Et_2O, either cold or boiling, is transformed only partially into cyclohexenol. *Chloro-4-cyclohexanone* (III), by oxidation of II with chromic mixt., bitter taste, b_{17} 95°, n_D^{20} 1.4867; *semicarbazone,* m. 191°. Louise Kelley

Some cyclohexyloxy derivatives. L. Palfray and S. Sabetay. Houbigant Lab., Puteaux, Seine. *Bull. soc. chim.* **43,** 900–3(1928).—Small portions of $C_6H_{11}OCH_2Cl$ (I) were added to an excess of MeONa (prepd. from powd. Na and MeOH in boiling PhMe), the mixt. was boiled until the filtered liquid contained no Cl, the NaCl sepd., the PhMe removed, and the liquid distd. *in vacuo.* The product, *methoxymethyl cyclohexyl ether,* mint-like odor, burning taste, b_{15} 61.5–2.5°, n_D^{17} 1.4387, n_D^{16} 1.4391, d_{16} 0.9375. By the same method, from the bis(chloromethyl) ether of 1,4-cyclohexanediol was obtained its *bis(methoxymethyl) ether,* burning taste, n_D^{17} 1.4490, d_{17} 1.038, b_{13} 121.5–2°. I with Ac_2O and AcONa gave *cyclohexyloxymethyl acetate,* fruity odor, b_{13} 96.5–7°, n_D^{15} 1.4465, d_{15} 1.022. From 75 g. of I, treated with 52 g. dry CuCN and heated on the oil-bath to boiling for 5 hrs., was obtained 36 g. *cyclohexyloxyacetonitrile* (II), penetrating odor, b_{15} 102–3°, n_D^{18} 1.4561, d_{18} 0.9825. *Cyclohexyloxyacetone* (8 g. from 13.9 g. II and an excess of MeMgI in Et_2O), agreeable odor, burning taste, b_{17} 98–8.5°, n_D^{17} 1.4522, d_{17} 0.9686. *α-Cyclohexyloxyacetophenone,* from II and PhMgBr, rather viscous oil, bitter taste, b_{14} 178°, n_D^{20} 1.5365, d_{20} 1.071. *s-Cyclohexyloxyphenylacetone,* from II and BzMgCl, bitter taste, b_{14} 185–6°, n_D^{21} 1.5200, d_{21} 1.044. *Me cyclohexyloxyacetate* (18 g. from 20 g. II and MeOH satd. with HCl), agreeable odor, bitter, burning taste, b_{16} 110°, n_D^{20} 1.4508, d_{20} 1.034. Attempts to reduce II with Pt black and H or with $SnCl_2$ in Et_2O satd. with HCl gave no satisfactory results. Louise Kelley

Carbon rings. XI. The 10-, 11-, 20- and 22-membered C rings and the formation of aliphatic ketones as well as the cyclic ketones obtained on decomposition of the metallic salts of polymethylenedicarboxylic acids. L. Ruzicka, M. Stoll and H. Schinz. Utrecht Univ. *Helv. Chim. Acta* **11,** 670–86(1928); cf. *C. A.* **22,** 2928.—On distn. of the salt of a polymethylenedicarboxylic acid the following might be formed:



(I) (II) (III)

$$H(CH_2)_xCOMe + H(CH_2)_xCO(CH_2)_xH + Me(CH_2)_{x-1}CO(CH_2)_xCO(CH_2)_{x-1}Me$$
(IV) (V)

Attempts were made to isolate as many of these compds. as possible. Since the yields of ring ketones with 9 or more members is very small, it was impossible to obtain sufficient starting material to give an amt. of compd. **III** sufficient for identification; it was not possible to ascertain with certainty if aliphatic ketones of type V are obtained simultaneously with 8- or 9-membered ring ketones, since the former do not form difficultly sol. semicarbazones. Compds. of the type **II** and **IV** were identified in each case. A table of yields of these various types obtained on distn. of dibasic acids from C_8 to C_{19} is given. *Cyclodecanone* (cf. *C. A.* **20,** 1792) prepd. by heating 1200 g. $(CH_2)_9(CO_2H)_2$ to decompn. (350–500°), collecting the distillate in xylene and finally by condensation with CO_2 + Et_2O cooling, was fractionated at 13 mm. and finally at 0.1 mm.; it gave a 3 g. yield of the *semicarbazone,* m. 205–7°, which was converted to the ketone, a colorless oil, b_{13} 106–7°, and which on standing at 10° gave crysts., m. 28°, d_4^{20} 0.9654, n_D^{30}

1.4782, M_D 45.57. The fraction $b_{0.1}$ 190–250° (130 g.) yielded 45 g of the *semicarbazone* (m. 228°) of cycloeicosan-1,1-dione, from which 15 g. of the diketone (VII) was obtained by hydrolysis with $H_2C_2O_4$; the diketone b_3 193°, crysts. from EtOH, m. 49–51°, d_4^{59} 0.9232, n_D^{59} 1.4662, M_D calcd. for $C_{20}H_{36}O_2$ 92.43, found 92.53; the *dioxime* forms crystals from EtOH, m. 147–8°. When 3 g. VII, 1 g. BzH and 0.8 g. Na in 40 cc. EtOH are allowed to stand for 2 weeks, dissolved in Et_2O, the NaOH removed by washing with H_2O, the Et_2O evapd., the residue steam-distd. to remove excess BzH, dissolved in Et_2O, washed with Na_2CO_3, dried over Na_2SO_4, the Et_2O evapd., heated with 2 g. $NaHSO_4$ for 1 hr. at 200°, dissolved in 30 cc. glacial AcOH, treated with O_3 for 8 hrs., CrO_3 added equiv. to 1 mol. O_2, treated with dil. HCl, extd. repeatedly with Et_2O, esterified with 10 cc. MeOH and 2 g. concd. H_2SO_4, 2 g. of *di-Me 9-ketooctadecane-1,18-dicarboxylate* is obtained, $b_{0.1}$ 210–30° and m. 59–60°; hydrolysis of this ester with alc. KOH, then acidifying and extg. the pptd. acid with PhH followed by reduction with Zn-Hg by Clemmensen's method gave *octadecane-1,18-dicarboxylic acid* (XII), m. 119–21°. On heating 3 g. VII with 25 g. Zn-Hg, 5 cc. concd. HCl and 10 cc. H_2O for 13 hrs. at 130°, extg. with Et_2O, washing with Na_2CO_3 and H_2O, evapg. the Et_2O and treating with $NH_2NHCONH_2$, it gave 3.1 g. of the *disemicarbazone* which was washed with EtOH in which it is almost insol.; the mother liquors were fractionally recrystd. and gave 0.3 g. of *cycloeicosanone semicarbazone*, m. 179–80°, hydrolyzed with 15% HCl to *cycloeicosanone* (VIII) ($C_{20}H_{38}O$), oil $b_{0.3}$ 170–1°, m. 58–9°. *Nonodecane-1,19-dicarboxylic acid* or *Japansäure* (IX), $(CH_2)_{19}(CO_2H)_2$, was obtained when Japan wax was hydrolyzed with alc. KOH, the acids thus obtained esterified (with EtOH and H_2SO_4) and then fractionated at 0.2 mm. to 0.5 mm.; it m. 112–3°; the *di-Me ester*, m. 57–8°; the Th salt on distn. gave VIII, proving the presence of $(CH_2)_{19}(CO_2H)_2$ in this wax (cf. *C. A.* 2, 801); no evidence was obtained for the presence of heptadecane-1,17- or octadecane-1,18-dicarboxylic acids in Japan wax. Electrolysis of a mixt. of the Na salt of 1-octenoic-8-acid (14 g.) and the acid ester of tetradecane-1,14-dicarboxylic acid (5 g.) gave *1-docosenoic-1-acid* which on oxidation with O_3 yielded X as follows: $CH_2{:}CH(CH_2)_5CO_2H + MeO_2C(CH_2)_{14}CO_2H \longrightarrow CH_2{:}CH(CH_2)_{19}CO_2Me \longrightarrow (CH_2)_{19}(CO_2H)_2$. *Cycloundecanone* (X), $C_{11}H_{20}O$ (0.8 g.) was obtained by dry distn. at 300–450° of 810 g. of the Y salt of $(CH_2)_{10}(CO_2H)_2$, dissolving the distillate in Et_2O, drying with Na_2SO_4, distg. at 10 mm. into fractions (*a*) 65–80°, (*b*) 80–100°, (*c*) 100–20°, (*d*) 120–50° and a residue (*e*), the semicarbazones in *b*, *c* and *d* were isolated, then hydrolyzed with $H_2C_2O_4$, the aliphatic ketones removed with $NaHSO_3$, washed with Et_2O, then converted to the *semicarbazone* (1.5 g.) which was recrystd. from EtOH and m. 202–3°; hydrolysis of the semicarbazone gave X which has an odor resembling camphor, m. 9–10°, d_4^{17} 0.9466, n_D^{17} 1.4786, M_D 50.32. The residue *e* was fractionated and the portion b_1 190–250° gave 8 g. of *cyclodocosane-1,12-dione* (XI), $C_{22}H_{40}O_2$, which was isolated as the *semicarbazone*, m. 228–30°, hydrolysis of which gave the diketone (XI), m. 55–6°, b_1 230°, d_4^{61} 0.9114, n_D^{61} 1.4633, M_D 101.6; *dioxime*, m. 151–3°; reduction (cf. formation of XII) yields *eicosane-1,20-dicarboxylic acid*, $(CH_2)_{20}(CO_2H)_2$, m. 120–2°, with the *di-Me 11-eicosanone-1,20-dicarboxylate*, $C_{24}H_{44}O_5$, m. 68–70°, as the intermediate product. As by-products in the prepn. of cyclodecanone, the following ketones were isolated with $NaHSO_3$ and converted to the following *semicarbazones: Me nonyl*, m. 115°; *Me decyl*, m. 104–5°; *Me undecyl*, m. 115–7°; *Me tetradecyl*, m. 117–8°; *Me hexadecyl*, m. 114–6°; and *Me heptadecyl*, m. 117–9°. **XII. The preparation of methylated 14-, 15- and 17-membered cyclic ketones.** L. RUZICKA, H. SCHINZ AND M. PFEIFFER. *Ibid* 686–700.—Since muscone is a 1-methylcyclopentadecan-3-one, attempts were made to prep. similar cyclic ketones with the Me group in a position 1, 2, 3 and 4 to the CO group and to compare the musk odors of such compds. The method of prepn. consisted in heating the Th or Y salts of polymethylenedicarboxylic acids and it was found that only those compds. with the Me group in position 3 or 4 yielded cyclic ketones. *1,3-Dimethylcyclotridecan-2-one* (5.4 g.) does not have a musk odor and was prepd. by destructive distn. of 173 g. of the Th salt of tetradecane-2,13-dicarboxylic acid (from the Na salt in H_2O and $Th(NO_3)_4$); the distillate was then redistd. at 12 mm., converted to semicarbazone in MeOH, which was sepd. and hydrolyzed to the ketone with concd. $H_2C_2O_4$; it b_{12} 130° – b_1 170°. An attempt to prep. 1-methylcyclotridecan-3-one from the Th salt of 2-methyldodecane-1,12-dicarboxylic acid was not successful, yielding a mixt. of products which were not completely sepd. and did not have a musk odor; 1-methylcyclotetradecan-2-one could not be prepd. from the Y salt of tetradecane-1,13-dicarboxylic acid and the product of distn. did not have a musk odor. *1-Methylcyclotetradecan-4-one*, m. 28–9°, which has a musk odor was prepd.

by heating to 170–80° the Y salt of 3-methyltridecane-1,13-dicarboxylic acid (133 g.); the 59 g. of product thus obtained was fractionated as follows: (*a*) 10 g., b_{12} 65–130°; (*b*) 4 g., b_{12} 130–50°; (*c*) 2.2 g., b_1 120–40°; (*d*) 5.5 g., b_1 140–60°; (*e*) 2.8 g., b_1 160–80°; all of these fractions were converted to the *semicarbazone* (*d* yielding the most), m. 182–3°; from the mother liquors the *semicarbazone* of *Me ω-methyltridecyl ketone* was obtained, m. 118–9°. An attempt to prep. 1-methylcyclopentadecan-2-one from the Th salt of pentadecane-1,14-dicarboxylic acid was not successful and did not give products with a musk odor. *1-Methylcyclopentadecan-2-one* was prepd. by adding 4 g. cyclopentadecanone in 100 cc. abs. Et_2O to 4 g. finely divided $NaNH_2$ under PhH and cooled with ice, allowed to stand several hrs., then shaken 2 days at room temp. The flocculent Na deriv. of the ketone was decanted with the liquid from the solid residue of $NaNH_2$, which was washed with abs. Et_2O, the Et_2O suspension boiled 2 days with excess MeI, treated with H_2O and distd., b_{12} 171–3°, converted to *semicarbazone* (m. 149–50°) and then the ketone was regenerated from the latter with $H_2C_2O_4$; the odor is similar but slightly less than the unmethylated ketone, d_4^{16} 0.9213, n_D^{16} 1.4812, M_D 73.60. 1,3-Dimethylcyclopentadecan-2-one could not be prepd. by distn. of the Y salt of hexadecane-2,15-dicarboxylic acid and the product of distn. did not have a musk odor. Attempts to prep. 1-methylcyclopentadecan-3-one (*dl*-muscone) from the Th salt of 2-methyltetradecane-1,14-dicarboxylic acid were not successful but gave a product which is probably *Me ω-methyltetradecyl ketone*, forming a *semicarbazone*, m. 122°; similarly the Y salt yielded the same semicarbazone (m. 122°) and another *semicarbazone* which is probably the isomer, m. 83°; regeneration of the ketones from the mother liquors gave an oil with a strong musk odor indicating the presence of traces of *dl-muscone*. Distn. of the Y salt of 2,13-dimethyltetradecane-1,14-dicarboxylic acid did not yield 1,5-dimethylcyclopentadecan-3-one but gave a very small amt. of *Me 2,3-dimethyltetradecyl ketone* which was isolated as the *semicarbazone*, m. 78–9°; the distillate had a very slight musk odor. *1-Methylcyclopentadecan-4-one* was prepd. by heating the Th salt of 3-methyltetradecane-1,14-dicarboxylic acid (from 81 g. acid) which yielded 60 g. of distillate and when fractionated gave: (*a*) 4 g., b_{12} 45–90°; (*b*) 7.2 g., b_{12} 90–150°; (*c*) 10.7 g., $b_{0.5}$ 120–60°; (*d*) 3 g., $b_{0.5}$ 160–80°; (*e*) 4.2 g., $b_{0.5}$ 180–205°; (*f*) 8 g., $b_{0.5}$ 205–50°. Fraction *c* has a decided musk odor and yields the greatest quantity of *semicarbazone*, m. 161–2°, although the latter could be obtained from all fractions; the ketone regenerated from the semicarbazone, $b_{0.5}$ 125° and has an odor which cannot be distinguished from muscone. Distn. of the Th salt of 4-methyltetradecane-1,14-dicarboxylic acid gave *1-methylcyclopentadecan-5-one*, which was isolated as the *semicarbazone*, m. 164°. Methylation of dihydrocibetone gave *1-methylcycloheptadecan-2-one*, which $b_{0.5}$ 150° and has an odor that can hardly be distinguished from the unmethylated ketone; the *semicarbazone*, m. 142–3°. *1-Methylcyclopentadecan-1-ol*, m. 85–6°, was prepd. by the Grignard reaction from cyclopentadecanone (10 g.) and MeI (5 g.); at the same time a small amt. of compd., m. 162°, was obtained and this is probably a *dimol. cyclopentadecanone* ($C_{30}H_{56}O_2$) or a *pinacone* ($C_{30}H_{58}O_2$); when the methylcyclopentadecanol was dehydrated by heating several hrs. with 90% HCO_2H it gave almost quant. *1-methylcyclo-1-pentadecene*, b_{12} 152–3°, d_4^{22} 0.8697, n_D^{22} 1.4853, M_D 73.26; reduction with H and Pt black in EtOAc gave *methylcyclopentadecane*, b_{12} 147–8°, d_4^{21} 0.8576, n_D^{21} 1.4735, M_D 73.34. N. A. LANGE

The configuration of polymethylenedicarboxylic acids. III. *cis*-Cyclobutane-1,2-dicarboxylic acids. RICHARD KUHN AND ALBERT WASSERMANN. *Helv. Chim. Acta* 11, 600–9(1928); cf. *C. A.* 22, 1761, 1765.—Et 1,1,4,4-butanetetracarboxylate, b_2 170–80°, was prepd. from 168 g. $CH_2(CO_2Et)_2$ and 55 g. $C_2H_4Cl_2$ and converted almost quant. to *1,1,2,2-cyclobutanetetracarboxylic ester* (I) by the action of Br_2 on the Na salt in abs. Et_2O (cf. Perkin, *J. Chem. Soc.* 65, 572(1894); *Ber.* 26, 243(1893); Beilstein, 4th Ed., 9, 725). When 45.5 g. I was sapond. with 130 g. $Ba(OH)_2.8H_2O$ in 2700 cc. H_2O, then acidified with H_2SO_4, the crude acid heated 30 min. at 200°, the black sirupy residue dried over P_2O_5 and KOH, dissolved in 150 cc. abs. MeOH, treated with dry HCl for 3 hrs. at 0°, stoppered and allowed to stand 2.5 days at room temp., dild. with 700 cc. H_2O, extd. 5 times with 100-cc. portions of Et_2O, the Et_2O ext. washed with H_2O and then dil. Na_2CO_3, dried and the Et_2O removed, 6 g. of a mixt. of the Me esters of *cis-* and *trans-cyclobutanedicarboxylic acids* were obtained, b_{11} 102–8°; sapon. of these esters gave 4 g. of mixed acids, m. 90–100° (fraction A). The aq.-alc. soln. from the Et_2O extn. above was evapd. to dryness, the residue extd. in a Soxhlet with Et_2O and gave 5 g. of acids sol. in Et_2O, m. 80–110° (fraction B). Fractions A + B (9 g.) were fractionally recrystd. 7 times from 35% HCl; the less sol. acid, m. 130° (uncor.), is *trans-1,2-cyclobutanedicarboxylic acid* (II), which was dried at 120°, recrystd. from Et_2O-petr.

ether and then from pure PhH; yield, 3.1 g. The Ba salt of this *trans*-isomer is identical with the *cis*-salt described by Perkin. All of the HCl mother liquors from the previous fractionations were united and further fractionated by crystn.; when no more crystals sepd. on cooling to room temp., the soln. was cooled with ice and 1.7 g. *cis*-isomer (III) sepd.; crystals from PhH, m. 97–8°. Mol. wt. detns. on these acids are 15% higher than the calcd. values (cf. *C. A.* **22,** 5). When 0.15 g. III was heated in a sealed tube with 5 cc. 35% HCl for 4 hrs. at 190°, the HCl evapd. and the dry residue recrystd. from PhH, 0.9 g. of II was obtained; conversion of III into II was also obtained by heating 2.5 hrs. at 100° with Ac_2O but not by boiling AcCl. These results indicate that the similarly constituted pair of isomeric acids described by Perkin were both the same compd., *viz.*, the *trans*-isomer. The 1st and 2nd dissocn. consts. (log K_1 and log K_2) were as follows:

Compd.	In H_2O	t°	In 50% MeOH	t°
II	log K_1 3.79	19°	log K_1 4.80	18°
II	log K_2 5.61	20°	log K_2 6.95	19°
III	log K_1 3.90	19°	log K_1 4.94	18°
III	log K_2 5.89	18°	log K_2 7.21	18°

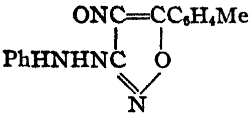
N. A. LANGE

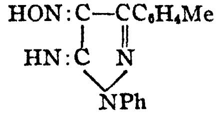
The stereoisomers of quinitol (1,4-cyclohexanediol). L. PALFRAY AND L. ROTHSTEIN. *Compt. rend.* **186,** 872–4(1928).—Samples of quinitol prepd. by the method of Senderens and Aboulenc (*C. A.* **16,** 1087) at 130°, 160°, 180° and 200°, resp., were available. In order to study the effect of conditions of prepn. on compn. a practical method was developed for sepg. the isomers, based on the difference in soly. in Me_2CO. Crystals of *trans*-quinitol (I) are sepd. by means of a high-speed centrifuge; *cis*-quinitol (II) is obtained from the mother liquor by distn. of the solvent. 100 g. of quinitol, prepd. at 200°, gave 40 g. of I, m. 139°, 34 g. of II, m. 102° and 15 g. of a mixt. The m.-p. curve of mixts. of I and II goes through a min. at 45% of I. Quinitol is volatile in steam and sublimes readily at 150–200°. I crysts. in flattened needles. II solidifies after fusion in both cubic and uniaxial crystals, the latter becoming in a few min. triclinic needles similar to those obtained from solns. Phenylurethan of I, m. 262°, of II, m. 188°. Quinitol is unaltered by heating in a sealed tube 2 hrs. at 180°, but in contact with Hg 95% is changed to I, the stable isomer, in 20 min. at 150°. Hg also affects the transition of derivs. of I and II. In anhyd. Me_2CO the solubilities (presumably in parts per 100 parts of soln.—ABSTRACTOR) are, I at 14°, 1.86, at 16°, 1.91; II at 14°, 5.56, at 16°, 5.61. In Me_2CO contg. 5% H_2O the solubilities are, I at 12°, 2.55, at 17.5°, 2.76; II at 12°, 5.10, at 17.5°, 5.26. MARGARET W. MCPHERSON

The fusion of cyclohexanol. N. N. NAGORNOV. *Ann. inst. anal. phys.-chim.* (*Leningrad*) **3,** 593–9; *Chem. Zentr.* **1927,** II, 2669.—Cyclohexanol, prepd. from PhOH by the method of Sabatier and Senderens, f. 23.72–23.40° and $b_{759.4}$ 160.4–0.6°. It exists in 2 allotropic modifications, the transformation point of which was 2.14°. The form stable at higher temps. dissolves considerable air, which is then evolved, with transformation into the other allotropic form. The dependence of the m. p. (t) on the pressure (P in megabars) between 1 and 127 megabars can be expressed as follows: $P = 441.80-51.5t + 1.394t^2$. The sp. vol. of the liquid is 1.0574 at 25° and is 1.0563 at 28.20°. The sp. vol. of solid cyclohexanol is 1.0304 at 25.10° and is 1.0284 at 28.20°. The heat of fusion at 23.7° is 2.71 cal. and at 28.20° is 5.44 cal. An extraordinarily small value of the heat of fusion which varies greatly with the pressure is obviously characteristic of hydroaromatic compds. (cf. Nagornov and Rotinjanz, *C. A.* **19,** 3266). C. C. DAVIS

Some heterocyclic derivatives of *p*-cymene. WALTER QVIST. Åbo Akad. (Finland). *Acta academiae Aboensis, mathematica et phys.* **4,** No. 3, 25 pp.; *Chem. Zentr.* **1927,** II, 1700–1.—A method for the *prepn. of di-p-toluylfuroxan* (I) is described and the action of amines and of hydrazines on this compd. was studied. The expts. show that the yields of acid hydrazides can be considerably increased if higher-boiling solvents are used in place of Et_2O in the prepns. *γ-Phenylhydrazino-β-nitroso-α-p-tolylisoxazole* (II), orange, prepd. by treatment of I with $PhHNNH_2$ in Et_2O, crystallizes from AcOH with 1 mol. of AcOH, dissolved in MeOH there seps. a cryst. *hydrate* contg. 2 mols. of H_2O, but no free isoxazole, as reported by Böeseken (cf. *Rec. trav. chim.* **16,** 297(1897)). The *isoxazole* is obtained only by keeping the hydrate over H_2SO_4. When the crystals contg. AcOH are dissolved in warm C_6H_6, a fairly stable cryst. *compd. with* C_6H_6 is obtained. When the C_6H_6 soln. is boiled, *1-phenyl-3-p-tolyl-4-isonitrosopyrazolone-5-imide* (III) or the *nitroso form* (IV) is formed, III probably being the red crystals and

IV probably being in the green soln. with org. solvents and in the green fused product. **The compd. can also be conceived to be** ***1-phenyl-3-p-tolyl-4-nitroso-5-aminopyrazole*** **(V).**


(II)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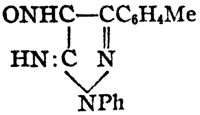
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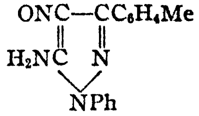

(V)

Exptl.—**I** was prepd. by heating *p*-cymene (10 g.) with concd. H_2SO_4 (10 g.) on the water bath, cooling, adding concd. HNO_3 (90 cc.), after cessation of the reaction pouring into cold water and recrystg. from EtOH. It m. 125–6°. Heated 7 hrs. on the water bath with $PhNH_2$ in Et_2O there was formed, besides *p-toluanilide*, m. 147–8°, *γ-anilino-β-nitroso-α-p-tolylisoxazole*, a soln. of which in EtOH with Zn dust and AcOH at 50° is reduced to *γ-anilino-β-amino-α-p-tolylisoxazole*, m. 145–9°. Prolonged heating of I with *o*-toluidine in Et_2O forms *γ-o-toluidino-β-nitroso-α-p-tolylisoxazole*, $C_{17}H_{15}N_3O_2$, black-green, becomes yellowish at 110° and m. 130°, also turns yellowish on exposure to air without appreciable change of compn., so that possibly an isomeric azoxime deriv. is formed. I and *p*-anisidine in Et_2O heated 1 hr. yield after crystn. from EtOH *p-toluo-p-aniside*, $C_{15}H_{15}NO_2$, m. 168–9°. Treated with cold AcOH the residue of the Et_2O filtrate of this last compd. yields *γ-anisidino-β-nitroso-α-p-tolylisoxazole*, $C_{17}H_{15}N_3O_3$, sinters approx. 150°, m. 180° (decompn.). Boiled several hrs. with MeOH and recrystd. from C_6H_6 it forms *p-anisidino-p toluylazoxime*, $C_{17}H_{15}N_3O_3$, m. 189.5–90.5°. I boiled 6 hrs. with *p*-tolylhydrazine in xylene or C_6H_6, evapd. and recrystd from C_6H_6, yields *p-toluo-p-tolylhydrazide*, $MeC_6H_4CONHNHC_6H_4Me$ (VI), sinters 176°, m. 177–8°. With EtOH as the reaction medium, it is possible, after removal of VI, by treatment with warm AcOH to obtain *γ-p-tolylhydrazino-β-nitroso-α-p-tolylisoxazole*, $C_{17}H_{16}N_4O_2$.AcOH, orange, m. 87–8°. In a similar manner from *o*-tolylhydrazine in Et_2O are obtained *p-toluyl-o-tolylhydrazide*, $C_{15}H_{16}N_2O$, sinters 170°, m. 172–3°, and the *compd.* $C_{17}H_{16}N_4O_2$.AcOH, orange, decomps. 106°. I boiled 4.5 hrs. with *α*-naphthylhydrazine in Et_2O and the product recrystd. from C_6H_6, yields *p-toluyl-α-naphthylhydrazide*, $C_{18}H_{16}N_2O$, m. 219–22°. I boiled 4 hrs. with *p*-nitrophenylhydrazine in EtOH and the product recrystd. from AcMe, yields *p-nitrophenyl-p-toluylazoxime*, decomps. 255–7°. I boiled with $PhNHNH_2$ in xylene or C_6H_6 and the product recrystd. from C_6H_6, yields *p-toluophenylhydrazide*, $MeC_6H_4CONHNHPh$, m. 166–7.5°. With Et_2O in place of xylene the yield is smaller, and from the residue of the filtrate can be obtained, by treatment with AcOH, *γ-phenylhydrazino-β-nitroso-α-p-tolylisoxazole*, $C_{16}H_{14}N_4O_2$.AcOH, decomps. 86–7°. Recrystd. from MeOH, the *isoxazole*, $C_{16}H_{14}N_4O_2.2H_2O$, is obtained, which kept over H_2SO_4 is converted into free *γ-phenylhydrazino-β-nitroso-α-p-tolylisoxazole*, $C_{16}H_{14}N_4O_2$, decomps. 92.5–3.5°. In a C_6H_6 atm., this latter compd. absorbs C_6H_6, forming a *C_6H_6-addn. compd.*, decomps. 101–2°. The latter boiled in C_6H_6 forms, on recrystn. from C_6H_6, *1-phenyl-3-p-tolyl-4-isonitrosopyrazolone-5-imide*, $C_{16}H_{14}N_4O$, dark red, m. 233–4°, hydrolyzed to *1-phenyl-p-tolyl-4-isonitrosopyrazolone-5*, $C_{16}H_{13}N_3O_2$, red, decomps. 197–201°. C. C. DAVIS

Determination of the configuration of space-isomeric hydroaromatic compounds. K. v. AUWERS AND A. SCHMELZER. *Sitzb. Ges. Beförderung gesamten Naturwissenschaften Marburg* **62**, No. 4, 113–35; *Chem. Zentr.* **1927**, II, 1562–4.—Previous methods for solving the problem of the classification of space-isomeric cyclic compds. into different *cis-* and *trans-*series have in general proved to be unreliable. In detg. configurations Skita has therefore made use of 2 principles, (1) that on hydrogenation and reduction, *cis*-compds. are formed in acid soln. and *trans*-compds. in alk. soln., and (2) that *cis*-compds. have higher d and *n* values and lower [α] values than the corresponding *trans*-compds. The correctness of (1) was proved by Skita in only a few cases, and its general validity is to be accepted because in many individual cases it conforms with principle (2). The latter, suggested by v. A. (cf. *Ann.* **419**, 92), has not been definitely proved, and discrepant cases are known. As a result, the value of the Skita method has been placed in doubt, and a further investigation of its validity has become necessary. The present paper deals with this problem and utilizes methylcyclohexanols and methylcyclohexylamines and their urethan, *p*-nitrobenzoate, acyl and phenyl-

urea derivs. *1,2-Methylcyclohexanol.*—According to Skita (*Ann.* **431,** 4, 17) the long-known compd. is the *trans*-form (phenylurethan, m. 105°) and the newly prepd. isomer (phenylurethan, m. 95°) the *cis*-form. v. A. and S. have obtained the former by various methods. The spectrographic observations of Skita on this form agree well; nevertheless it is surprising that the $E\Sigma_D$ value is only a little different from that of the isomer. The observations of v. A. and S. vary, but show differences in the $E\Sigma_D$ values which are to be expected. A safe opinion whether the v. A. rule is correct in this case is not yet possible. *1,2-Methylcyclohexylamine.*—The compd. obtained in alk. soln. from 1,2-methylcyclohexanone oxime is, according to the Skita rule, the *trans*-form, since on conversion to the alc. no unsatd. hydrocarbon is formed. A higher m. p. of its phenylurea than reported by earlier investigators (cf. Skita, *Ber.* **56,** 1015) was found. The phys. consts. deviate from the Skita values, but agree with those of Gutt (cf. *Ber.* **40,** 2065(1907)). *1,3-Methylcyclohexanol.*—The data in the literature are discordant. Its identification is difficult, for its esters remain in an oily form, and the m. ps. of their phenylurethans differ but little, according to Skita 91° for the *cis*- and 96–7° for the *trans*-form. v. A. and S. obtained a compd. having the m. p. of the *cis*-form, though according to its mode of prepn. it should have been the *trans*-form. With respect to the spectrographic data Skita had already shown that the rule is not valid in every respect, since the n value of the *cis*-form is smaller than that of the *trans*-form. In far greater opposition to the rule are the older observations of Knoevenagel (*Ann.* **297,** 117(1897)), according to which the relation between the consts. is exactly reversed. The d. data of Skita also controvert the rule. The same anomalies appear especially in the *m* series. *1,3-Methylcyclohexylamine.*—This was prepd. in alk. soln. The m. ps. of its derivs. differed from those recorded by Skita for the *trans*-forms. Perhaps some *cis*-compds. were formed in spite of the alk. media. The spectrochem. observations of Skita again controvert the rule in this case, but it is questionable whether these data are wholly reliable, for the values found by v. A. and S. agree well with those of Gutt. Whether here a true deviation from the rule exists is still uncertain. *1,4-Methylcyclohexanol.*—The spectrochem. observations of the *trans*-form agree well, but are less concordant for the *cis*-form, so that the mutual relation is still uncertain. *1,4-Methylcyclohexylamine.*—Data in the literature on the m. p. of the phenylurea are very discordant. With respect to the spectrochem. data on the *trans*-form there is better agreement in the data of Gutt than in those of Skita. As yet no final conclusions can be drawn from these investigations. It is believed by v. A. and S. that the mode of experimentation of Skita leads to the formation of both space-isomers as is the case in all such reductions. A reliable decision is possible, however, only when from homogeneous derivs. the carbinols and amines are regenerated. Far more difficult is the detn. of the configuration of each individual compd. The older rule that *cis*-forms melt at the lower temps. and are the more volatile has, on account of numerous exceptions, only a probability value. The belief that more reliable conclusions can be drawn from closing and opening of rings is also now discredited, as evidenced particularly by the expts of Böeseken. An explanation of these phenomena is probably to be sought in the fact that atoms in rings of more than 5 members lie in different planes (cf Hückel, *Ann.* **451,** 109). Moreover Ott and Schröter (*Ber.* **60,** 624) have shown that the formation of *cis*- and *trans*-forms is associated with energy rather than with spatial relations. The surest guide to the detn. of configuration remains a study of the asym. C atom. If a compd. theoretically can exist in a *dl*- and in a *meso*-form, then *cis*- and *trans*-modifications are certain, provided that the optical resolution of 1 isomer is accomplished. The carbinols and amines would have to be transformed first into the appropriate compds., because of their unsym. structure, which precludes *meso*-forms. The Walden transformation is also to be considered. Thus Sabatier obtained from 1,2-methylcyclohexanol (*trans*) various 1,2-methylchlorocyclohexanes depending upon whether PCl_5 (Gutt) or HCl (Zelinskii, *Ber.* **41,** 2680 (1908)) was used. The product from PCl_5 yielded with Mg and CO_2 solid, the other yielded liquid hexahydro-*o*-toluic acid. If the solid acid is considered to be the *trans*-form, as usual, then according to the transformation with HCl a Walden conversion should take place. In this case the consts. of the chloride would not conform to the v. A. rule; otherwise the configuration of the acids would have to be changed, or Walden conversion assumed for the transformation of the chlorides into the acid. The following exptl. data show the consts. obtained by v. A. and S. for the compds.: *Cyclohexanol,* prepd. from cyclohexanone with Na in Et_2O + water, b. 157–9°, d_4^{20} 0.948, n_{He}^{20} 1.4629, $E\Sigma_D$ −0.17, $E\Sigma_{\beta-\alpha}$ 2%. *Ac deriv.,* prepd. by boiling Ac_2O, b. 173.5–174.5°, d_4^{20} 0.974, n_{He}^{20} 1.4411, $E\Sigma_D$ −0.05, $E\Sigma_{\beta-\alpha}$ −3%. *m-Nitrobenzoyl deriv.*

$C_{13}H_{15}O_4N$, oil. *p-Nitrobenzoyl deriv.*, $C_{13}H_{15}O_4N$, m. 50.5–51.5°. *Phenylurethan*, m. 81.5°. *Cyclohexylamine*, prepd. from cyclohexanone oxime with Na in boiling EtOH, with steam-distn., concn. with HCl and decompn. with alkali, d_4^{20} 0.873, n_{He}^{20} 1.4605, $E\Sigma_D$ —0.01, $E\Sigma_{\beta-\alpha}$ —2%. *1,2-Methylcyclohexanol* was prepd. in 3 ways: (1) from *o*-cresol by the Sabatier method; (2) from the ketone with Na and boiling EtOH, and (3) from 1,2-methylcyclohexylamine-HCl in warm water with $NaNO_2$ + AcOH, under which conditions it b. 167.6°, 167°, 168°, b_{18} 71–2°, d_4^{20} 0.928, 0.926, 0.927, n_{He}^{20} 1.4634, 1.4613, 1.4608, $E\Sigma_D$ 0.05, —0.01, —0.08. *Ac deriv.*, b. 183–4°, d_4^{20} 0.949, n_{He}^{20} 1.4383, $E\Sigma_D$ −0.01, $E\Sigma_{\beta-\alpha}$ —2%. *m-Nitrobenzoyl deriv.*, $C_{14}H_{17}O_4N$, oil. *p-Nitrobenzoyl deriv.*, m. 64.5–65.5°. *Acid phthalate*, $C_{15}H_{18}O_4$, prepd. in C_5H_5N with pptn. by Na_2CO_3, m. 122–3°. *Phenylurethan*, m. 105–6°. *α-Naphthylurethan*, $C_{18}H_{21}O_2N$, m. 156–7°. *1,2-Methylchlorocyclohexane*, prepd. from the carbinol with 2 vols. of fuming HCl for 4.5 hrs. at 120–30°, b. 152–4°, d_4^{20} 0.967, n_{He}^{20} 1.4586, $E\Sigma_D$ 0.18, $E\Sigma_{D\beta-\alpha}$ 2%. *1,2-Methylcyclohexylamine*, from 1,2-methylcyclohexanone oxime, b. 145–6° (in H current), d_4^{20} 0.854, n_{He}^{20} 1.4550, $E\Sigma_D$ 0.18, $E\Sigma_{D\beta-\alpha}$ 2%. *Picrate*, yellow, m. 178–9°. *Bz deriv.*, m. 149–50°. *Phenylurea*, $C_{14}H_{20}ON_2$, m. 156–8°. *1-Methylurea*, $C_{18}H_{34}ON_2$, crystd. from abs. EtOH, m. 214–5°. *1,3-Methylcyclohexanol*, prepd. in 3 ways: (1) from *m*-cresol by the Sabatier method, b_{17} 80–1°, d_4^{20} 0.918, n_{He}^{20} 1.4591, $E\Sigma_D$ 0.12; (2) the *trans*-form of Skita (phenylurethan m. 93°), b. 171.5–172.5°, d_4^{20} 0.919, n_{He}^{20} 1.4589 and (3) the *cis*-form of Skita, b. 174.6–175.0° (cor.), d_4^{20} 0.923, n_{He}^{20} 1.4565. *m-* and *p-Nitrobenzoyl derivs.*, $C_{14}H_{17}O_4N$, oils. *Phenylurethan*, $C_{14}H_{19}O_2N$, m. 90.5–91.5°. *α-Naphthylurethan*, $C_{18}H_{21}O_2N$, m. 128.5–9.5°. *1,3-Methylcyclohexylamine*, b. 144–5°, d_4^{20} 0.848, n_{He}^{20} 1.4524, $E\Sigma_D$ 0.23, $E\Sigma_{\beta-\alpha}$ 3%. *Picrate*, oil. *Bz deriv.*, $C_{14}H_{19}ON$, prepd. with ice-cold 2 *N* NaOH, m. 108°. *Phenylurea*, $C_{14}H_{20}N_2$, m. 162.5–165°. *1,4-Methylcyclohexanol*, prepd. in 3 ways: (1) by the method of Skita which gives the *trans*-form, b. 171.3–172° (cor.), d_4^{20} 0.920, n_4^{20} 0.920, n_{He}^{20} 1.4595, $E\Sigma_D$ 0.07; (2) from *p*-cresol by the method of Sabatier, b. 172.5–172.8°, d_4^{20} 0.917, n_{He}^{20} 1.4583, $E\Sigma_D$ 0.10 and (3) by the method of Skita which gives the *cis*-form, b. 173–173.8° (cor.), d_4^{20} 0.9185, n_{He}^{20} 1.4952, $E\Sigma_D$ 0.15. *p-Nitrobenzoyl deriv.*, $C_{14}H_{17}O_4N$, m. 62–3°. *Phenylurethan*, m. 123.5–124.5°. *1,4-Methylcyclohexylamine*, m. 147–8° (in a H current), d_4^{20} 0.846, n_{He}^{20} 1.4514, $E\Sigma_D$ 0.23, $E\Sigma_{\beta-\alpha}$ 3%. *Picrate*, oil. *Bz deriv.*, m. 177–8°. *Phenylurea*, $C_{14}H_{20}ON_2$, m. 210–11°. C. C. Davis

Laws of aromatic substitution. IX. Bernhard Flürscheim and Eric Leighton. *J. Chem. Soc.* 1928, 2230–42; cf. *C. A.* **22**, 3403.—The following figures give the av. mol. % of *m*-substituent formed on nitrating and the ratio of $m/(o + p)$: PhCN, 88.25, 751; $PhCH_2CN$, 12.70, 14; $PhCH(CO_2Et)CN$, 37.20, 59.2; $PhCH(CN)_2$, 67.90, 211.8; $PhC(CO_2Et)_2CN$, 69.55, 228.6; $PhC(CO_2Et)(CN)_2$, 87.5, 698.4; PhCHClCN, 50.05, 100.20; PhCH(OH)CN, 43.55, 77.25; $PhCH:NC_6H_4NO_2$-*m*, 87.05, 672.2; PhCHO, 78.65, 368.4. *Et phenylcyanomalonate*, b_1 140–1°, from $PhCH_2CO_2Et$, Na and $ClCO_2Et$. *Et phenyldicyanoacetate*, m. 60°, from $PhCH(CN)_2$, Na and $ClCO_2Et$. Full details are given of the nitration expts. The relative effects of Cl, CO_2Et and CN are discussed. C. J. West

Steric hindrance. Walter Hückel. Univ. Freiburg i Br. *Ber.* **61B**, 1517–24 (1928).—To answer some of the objections which were raised against the Meyer theory of steric hindrance, the assumption of "chem." influences of the adjacent substituents on the reactive group, in addn. to "spatial" factors, was invoked. In the interpretation of the phenomena grouped under "steric hindrance" there was thus introduced an arbitrary concept which must persist as long as it is not possible to sep. the "chem." and "mech." constitutional influences and to represent them by measurable magnitudes. The study of sterically hindered reactions would seem to be a part of the problem of the relation between reaction velocities and constitution. But the reaction velocity consts. amenable to direct measurement are themselves functions of several variables, each dependent in its own peculiar way on the constitution. By making certain assumptions, however, the reaction velocity consts. can be essentially represented as the function of 2 variables, $k = \alpha . e^{-q/RT}$, where q is the activating energy (the energy which must be supplied to the reacting mols. to bring them to the state where they can react) and α represents the frequency of successful approaches to each other of the reacting mols. (cf. Trautz, *C. A.* **13**, 3053, and others); H. calls α the "action const." q can be calcd. from the temp. coeffs. of k, and α by substituting the calcd. value of q in the above equation for k measured at any desired temp. A decrease in α with change in structure might then be pictured as a narrowing or a de-

crease in the no. of the paths leading to the reacting groups and an increase in q as a change from a level or gently rising road to a steep mountain road. Calcn. of q and α from Vavon's measurements of the esterification velocities at different temps. of the *cis*- and *trans*-forms of various substituted cyclohexanols (V. and Anziani, *C. A.* **22,** 1334, and earlier papers) shows that considerable variations in reaction velocity may rest on great variations in q as well as of α; whether or not this is a case of "steric" hindrance cannot be definitely detd. A similar calcn. from Olsson's measurements of the sapon. velocities of various esters shows that with esters of primary alcs. the values of q and α are approx. equal while for the 1 tertiary alc. studied q is about 1000 cal. smaller and α about 10 times smaller, both factors tending to decrease the velocity const. of sapon., which is about 10^2 smaller than that of the primary alc. esters; with the esters of secondary alcs. the values of q and α show a drift with the temp.; whether this is real and the formula therefore does not hold strictly or is due to errors in measurement or impurities in the substances used cannot for the present be detd. In studies on the influence of substituents on velocity consts. differences in the velocity consts. have often been tacitly aligned with corresponding differences of the activating energy (the greater the const. the less the activating energy), deviations from the expected parallelism being ascribed to "steric" factors. But such a relationship cannot be expressed quant. for the difference in activating energy depends on the nature of the substitution reaction (*e. g.*, in the bromination of PhMe $q_o - q_p = 658$, in its nitration 135). Thus Olivier (O. and Berger, *C. A.* **21,** 3356, and earlier papers) concludes from the sapon. velocities of the halogenated benzyl chlorides that there is no steric factor because the ratio k_o/k_p is generally about the same whereas, he thinks, according to the theory of steric hindrance it should decrease in the series Cl ⟶ Br ⟶ I with the size of these atoms, but his data show that the magnitude of the action const. changes in a varying, often quite striking manner according as the substituents are in the *o*-, *m*- or *p*-position. Taking as an example of the application of the above views to equil consts. the relation between constitution and the dissocn. consts. of org. acids, which depend on the ratio of the frequency of the dissocn. process k_d to that of the association process k_a, it is quite conceivable that the increase in the dissocn. const. by an *o*-substituent may be due not only to an increase in k_d (chiefly represented by the activating energy necessary to split off the H ion) but to a decrease in k_a, as the result either of a decrease in the action const. or an increase of the activating energy, without any material increase in k_d. C. A. R.

Steric hindrance in the behavior of phenyl alkyl ethers and derivatives. L. CHAS. RAIFORD AND D. M. BIROSEL. State U. of Iowa. *Proc. Iowa Acad. Sci.* **34,** 222–3 (1927).—It is known that Ph alkyl ethers substitute in the Ph radical less easily than phenol; nevertheless, PhOEt will give a tribromophenyl compd. When the allyl deriv. is used, both Ph and allyl radicals may be involved in the change. Expts. in progress show that rearrangement of the allyl ether by heat, according to Claisen's method, may cause a loss of Br. W. G. GAESSLER

Effect of substituents in the formation and reactions of certain ethers. L. CHAS. RAIFORD AND GARRETT THIESSEN. State U. of Iowa. *Proc. Iowa Acad. Sci.* **34,** 220–1(1927).—The structures of several derivs. prepd. to show that the presence of a nitro radical in Ph_2O interfers with the entrance of Br to a much greater degree than could have been predicted on the ground of steric hindrance, have been detd. in several cases and a no. of other new halogenated derivs. have been prepd. These expts. have been conducted in the presence of aq. alkali, a method which was in part standardized and designated in previous work (*C. A.* **20,** 3694) as the "wet method." In the present work this process has been shown to be capable of 2 modifications, each with somewhat sp. applications which can, in general, be predicted. A 2nd point of interest in this work is the structure of the tetra-Br deriv. of Ph_2O obtained some years ago by Cook (*C. A.* **4,** 3206) by direct bromination. A no. of derivs. of this product have been obtained, but there is still some doubt as to the exact structure of the compd. Negative results are due in part to the stability of Ph_2O derivs., which makes it difficult to "split" the compds. in such a way as to recognize the character of the radicals present. W. G. GAESSLER

***o*-Effect and reactivity. I. Magnitude and cause of the *o*-effect in the hydrolysis of aromatic esters.** KARL KINDLER. Univ. Hamburg. *Ann.* **464,** 278–92(1928).—The total effect of a radical R in the *o*-position with respect to CO_2Et in a C_6H_6 nucleus is the result of (1) the influence of R on the strength of attachment of the whole aryl grouping to the CO_2Et group, shown in previous papers to det. the rate of hydrolysis of the ester, and (2) the direct influence of R as a center of unsatn. on the CO group. It is possible to det. the 2nd or "*ortho*" effect as follows: The *o*-effect is negligible in

esters of the type $RC_6H_4CH{:}CHCO_2Et$; the strengths of attachment (*a*) of Ph, (*b*) of RC_6H_4, (*a'*) of styryl and (*b'*) of $RC_6H_4CH{:}CH$ are found to be connected by the equation $\sqrt{a}:\sqrt{b} = a':b'$. By detg. the rates of hydrolysis of a series of *o*-substituted benzoic and cinnamic esters, it is thus possible to calc. (*b*) and so det. the direct *o*-effect. For R = F, Cl, Br, I and NO_2, the relative strengths of attachment of RC_6H_4 to the CO_2Et group are given by the figures 18.2, 25.2, 10.6, 15.8 and 1.91, resp., the relative *o*-effects of R being given by the figures 1, 2, 5, 7.5 and 11, resp. These last figures assume more importance when expressed on the basis of Cl = 35.5, when they become 17.8, 35.5, 88.8 and 133 for the 4 halogens. The velocity coeffs. for the alk. hydrolysis are given for *o*-$FC_6H_4CO_2Et$, 0.272; *p*-deriv., 0.0939; *o*-$ClC_6H_4CO_2Et$, 0.0937; *o*-$BrC_6H_4CO_2Et$, 0.0925; *o*-$IC_6H_4CO_2Et$, 0.0409; *o*-$O_2NC_6H_4CO_2Et$, 0.280. *o-Fluorocinnamic acid*, m. 175° (cor.); *Et ester*, b_{11} 140–1°, *k* 0.248; *Et p-fluorocinnamate*, b_{11} 135–40°, m. 30–2°, *k* 0.145; *o*-Br deriv., *k* 0.325; *p*-Br deriv., 0.238; *o*-I deriv., 0.267; *p*-I deriv., 0.239; *m*-NH_2 deriv., 0.0661. The cause of the *o*-effect is discussed. It is not steric in origin and is attributed to the unsatd. nature of the group in question. The strongly unsatd. NO_2 group has a particularly large *o*-effect. C. J. West

The reactions of Friedel and Crafts, Fries and Gattermann. K. v. Auwers and W. Mauss. Chem. Inst., Marburg. *Ber.* **61B**, 1495–507(1928).—Meisenheimer and Hanssen (H., *Diss. Tübingen* 1926) found that 2,4-$Me_2C_6H_3OMe$ (I) with BzCl and $AlCl_3$ gives, besides the *o*-hydroxy ketone, a *m*-hydroxy ketone as chief product, the orienting influence of the two Me groups therefore being stronger than that of the MeO group. If this hitherto unknown course of a Friedel-Crafts reaction should occur regularly with phenol ethers of a definite structure it might make possible the prepn. of certain *m*-hydroxy ketones which can hardly be made by other methods. In agreement with Meisenheimer, certain expts. along this line have therefore been made. Replacing the BzCl in Hanssen's expt. with AcCl, v. A. and M. obtained, in addn. to the known 2,4,6-$AcMe_2C_6H_2OH$, m. 53–4°, an isomer (II), m. 131°, non-volatile with steam, and its *Me ether*, m. 51°, volatile with steam and easily hydrolyzed to II. II regenerated 2,4-$Me_2C_6H_3OH$ (III) when boiled with H_3PO_4 and could therefore be only 1 of the 2 possible *m*-Ac derivs. Its ability to form an oxime showed that it is *2,4-dimethyl-5-acetophenol*. Similar results were obtained with $ClCH_2COCl$ instead of AcCl and with 2,4-$EtMeC_6H_3OH$ (IV) instead of I. It may therefore be concluded that the ethers of all dialkylphenols analogous to III give in the F.-C. reaction with acid chlorides more or less of the *m*- along with *o*-hydroxy ketone. Another group of phenols which can give a *m*-deriv. is that of the sym. trisubstituted compds. Under the ordinary conditions the reaction proceeds only with difficulty and incompletely, most of the original ether being recovered unchanged, but the part that does react is converted almost exclusively into a *m*-hydroxy ketone. Thus, it had already been shown (*C. A.* 22, 3646) that 2,4,6-$Me_2EtC_6H_2OMe$ gives 2,4,6,3-Me_2EtAcC_6HOH, and mesitol (V) has now been found to yield *m-acetomesitol* (VI), m. 81–2°, whose structure is proven by its regeneration of V with boiling H_3PO_4. The course of the reaction may be more complicated with those phenol ethers which have more loosely bound substituents (*e. g.*, Et) on the nucleus. As already shown, 2,4,5-$Et_2MeC_6H_2OMe$ with AcCl and $AlCl_3$ gives both 2,4,5,6-Et_2MeAcC_6HOH and 2,4,5-$AcEtMeC_6H_2OH$, the 2-Et group in part of the mol. being split off. Similarly 2,5,4-$Et_2MeC_6H_2OMe$ (VII) with 1.5 mols. each of AcCl and $AlCl_3$ in CS_2 gives an alkali-sol mixt. consisting chiefly of a yellow oil (VIII), b_{15} 144–7°, with a very small quantity of a reddish yellow oil (IX), b_{15} 164–72°, and an alkali-insol. part consisting mostly of unchanged VII with a little yellowish oil, b_{16} 148–62°, which was not further studied. That VIII is an *o*-hydroxy ketone was shown by the deep blue color which it gives with $FeCl_3$ and since on reduction by the Clemmensen method it gives *4-methyl-2,5-diethylphenol* (X), m. 54°, it must be *4-methyl-5-ethyl-2-acetophenol*. **IX** also gives a deep blue color with $FeCl_3$ and is probably 2,5,4,6(?)-Et_2MeAcC_6HOH. Under certain conditions a *m*-Et group may be split off. *2,4-Dimethyl-5-ethylphenol Me ether* (XI), obtained by reduction of the Me ether of II by the Clemmensen method, with 1.5 mols. AcCl and 2 mols. $AlCl_3$ gave considerable II and an oil (XII), b_{11} 150–60° (about 2 g. from 10.5 g. XI), sol. in alkalies with yellow color and giving a blue color with $FeCl_3$. Its oxime with boiling HCl gave a base and the XII may therefore be assigned the structure 2,4,5,6-Me_2EtAcC_6HOH. A 3rd product, m. 120–5°, was obtained in too small quantity for identification. In the above 3 cases the Et group is split off although there is an unoccupied *o*-position; the last example shows distinctly that alkyls tend to direct an entering acyl group more to the *p*- than to the *o*-position to themselves. All the above results show, furthermore, that, like the Fries shiftings, the F.-C. reaction with polyalkylated phenol ethers may proceed in quite different

ways and therefore the structure of the resulting products must be detd. in each individual case. When Hanssen heated the benzoate of III with 1.5 parts $AlCl_3$ 4 hrs. at 130–40°, he recovered 70% of the material unchanged and 17% changed into a mixt. of 2,4,6-, 2,4,5- and 2,5,4-$Me_2BzC_6H_2OH$ but a repetition of his work gave quite different results. The normal product of shifting, the 2,4,6-compd. (**XIII**), was obtained in 50% yield and in pure form, m. 40–1° (H.'s impure prepn. remained oily); the oxime, like H.'s, m. 153–4°. Of the 2,4,5-compd., m. 140–1°, only a small quantity (about 4%) could be isolated. No unchanged benzoate or 2,5,4-$Me_2BzC_6H_2OH$ was obtained. The difference in the results is easily explained. The formation in H.'s expt. of the 2,5,4-compd. was undoubtedly due to the presence of some *p*-xylenol in his III, and the fact that in spite of the high temp. he recovered 70% of his material unchanged indicates that his $AlCl_3$ was not fresh and was therefore no longer able to effect a true Fries shifting but in part did not act at all and in part exerted only a hydrolytic action, the resulting BzCl then effecting a F.-C. synthesis in the manner characteristic of phenols of the type of III. The formation of the small quantity of the 2,4,5-compd. in the v. A. and M. expt. may also have been due to a preliminary hydrolysis by the $AlCl_3$, the extent of which depends on the quality of the $AlCl_3$ and perhaps on the firmness with which the acid radical is held. The important point is that whereas the F.-C. reaction may with phenols of a definite structure give *m*-derivs. as the chief products, this is not the case in the Fries shifting, *i. e.*, it makes a difference whether the acid residue is introduced into the phenol from without or is already present in the phenol. v. A. and M. conclude that the Fries shifting occurs within a single mol. and is therefore fundamentally different from the F.-C. reaction. It had already been shown that a Me group forced to migrate by an acid residue can itself displace an Et group. To det. whether this occurs regularly, *2,5-dimethyl-4-ethylphenyl acetate* (**XIV**) was heated with $AlCl_3$; the only rearrangement product was the same 2,4,3,6-Me_2EtAcC_6HOH as was previously obtained from 2,6,4-$Me_2EtC_6H_2OAc$, but when *4-methyl-2,5-diethylphenyl acetate* (**XV**) was treated in the same way, the *m*-Et group was forced to migrate by the Ac residue but was unable to displace the *p*-Me group, going instead to the 5-position; the product was 4,2,3,6-$MeEt_2AcC_6HOH$; at the same time was formed a small quantity of another substance (**XVI**) which in all probability was the normal product of shifting, 4,2,5,6-$MeEt_2AcC_6HOH$, for its oxime on boiling with HCl underwent the Beckmann rearrangement completely or in part, indicating the presence of an alkyl next to the Ac group. In a repetition of the earlier expts with 2,5-$Me_2C_6H_3OH$, the normal rearrangement product, 2,5,6-$Me_2AcC_6H_2OH$ (**XVII**), which before had been sought in vain, was again not obtained in pure state but there was formed a substance whose oxime gave an aminophenol with boiling HCl Since the F.-C. reaction gives *m*-hydroxy ketones in certain cases, it became necessary to det. whether the Gattermann aldehyde synthesis may also proceed in this way under certain conditions. A series of phenols (including **III**) gave, along with the *o*- or *p*-hydroxy aldehydes, either no other compd. at all or only very small quantities. Mesitol Me ether, however, in a 1st expt. gave an alkali-insol. aldehyde (**XVIII**) sapond. by $AlCl_3$ to a *trimethylhydroxybenzaldehyde* (**XIX**), m. 106–9°, which is certainly not an *o*-deriv. and is probably 2,4,6,3-$Me_3(HO)C_6HCHO$. In a 2nd expt. was formed directly a very small quantity of a *dimethylhydroxybenzaldehyde* (**XX**), m. 106–7° (*oxime*, m. 164.5–5°), which proved to be different from the known, 3,5,4-$Me_2(HO)C_6H_2CHO$; because of the poor yields and the high cost of the material, it was not further investigated. A 3rd expt. gave the same results as the 1st. As the yield of **XIX** was small and reduction by the Clemmensen method also gave a small yield of the corresponding Me_4C_6HOH, the latter could not be completely purified; it m. 75–6.5° while the m. p. of 2,3,4,6-Me_4C_6HOH is given in the literature as 80–1°. The above structure is therefore assigned to **XIX** only with some reserve. 2,3-$Me_2C_6H_3OH$, as expected, gave 2,3,4-$Me_2(HO)C_6H_2CHO$ (**XXI**) almost exclusively, but the 2,3,4-$Me_3C_6H_2CHO$, obtained by reduction of **XXI**, yielded only a small quantity of the normal product, *3,4,5-trimethyl-2-hydroxybenzaldehyde* (**XXII**), the chief product being **XXI**. This shows how strong is the tendency to the formation of *p*-derivs. in the Gatterman synthesis and is worthy of note in that it is not a loosely held Et group but a Me group which is driven out. The above expts. give little indication of any tendency to the formation of *m*-derivs. in the G. synthesis but show that the displacement of alkyls occurs as readily as in the Fries shifting. *Me ether* of **II**, b_{13} 140–2°. Free **II** gives a faint greenish color with $FeCl_3$ and dissolves in alkalies with yellowish color; *oxime*, m. 42–6°. *m-Chloroaceto-asym-m-xylenol*, m. 107–7.5°, somewhat volatile with steam, gives no color with $FeCl_3$. *2-Ethyl-4-methylphenyl Me ether*, b. 206–8°, gives by the F.-C. reaction *2-ethyl-4-methyl-5-acetophenyl Me ether*, faintly yellow,

b_{16} 148–50°, the yellow 2,4,6-$EtMeAcC_6H_2OH$, and *2-ethyl-4-methyl-5-acetophenol*, m. 120–1°, which gives a faint green color with $FeCl_3$ and is readily reduced to *4-methyl-2,5-diethylphenol*, m. 54–54.5°, b. 248–50°; whose *Me ether* b. 234–6°. *2,5-Dimethyl-4-ethylphenol*, m. 39–40°, gives only a very faint green color with $FeCl_3$; *acetate* (XIV), b. 248–50°. XV, b. 260–2°. XXII, m. 36–7°, sol. in dil. NaOH with bright yellow color, gives a deep greenish blue color with $FeCl_3$. C. A. R.

Mechanism of the Fries rearrangement. K. v. Auwers and W. Mauss. Univ. of Marburg. *Ann.* **464**, 293–311(1928); cf. *C. A.* **22**, 1762, 3646.—The claims of Rosenmund and Schnurr (*C. A.* **22**, 1579) in connection with the general improvement of methods of effecting the Fries rearrangement is criticized, for although R. and S. have considerably improved those methods, some phenol esters, *e. g.*, the Ac and Bz deriv. of 2-hydroxymesitylene, do not undergo the change under the conditions laid down by R. and S. Moreover, phenyl benzoates and chloroacetates require more drastic treatment than do the corresponding acetates. Thus, $ClCH_2CO_2Ph$ and $ClCH_2CO_2C_6H_4Me$ (*m*) do not undergo the Fries change in 1 day in cold $PhNO_2$ and $AlCl_3$, whereas *m*-$MeC_6H_4CO_2Me$ and 2-*m*-xylyl acetate under similar conditions afford good yields of ketones. 4- and 5-Xylyl acetates, the acetate and chloroacetate of 2,6,4-$Me_2EtC_6H_2OH$ and the *chloroacetate*, b_{12} 138°, of 3-chloro-*o*-cresol, are to a slight extent hydrolyzed but are otherwise unaffected under these conditions. *2,4,6-Trichlorophenyl acetate*, m. 49–51°, is unaffected by $AlCl_3$ in 0.25 hr. at 150°, while after 4 hrs. at 130–40° in presence of excess of chloride, tar, some $Cl_3C_6H_2OH$ and a trace of an *o*-hydroxy ketone (?) are found. When heated with $AlCl_3$ for 1 hr. at 100–40°, 2,6-$ClMeC_6H_3O_2CCH_2Cl$ gives, as main product, *3-chloro-4-hydroxy-5-methylphenacyl chloride*, m. 98.5–9.5°; whether or not any *o*-displacement occurs is uncertain. R. and S.'s conclusion that the Fries rearrangement is bimol. in type, *i. e.*, is a reaction of the Friedel-Crafts type between 2 mols. of a phenol ester, is open to criticism, if for no other reason than that while Fries changes lead to *o*- as well as to *p*-compds., Friedel-Crafts reactions give exclusively the latter. Other evidence shows the untenability of R.'s view. Meissenheimer and Hanssen (*Diss. Tübingen* 1926) have shown that BzCl and 4-*m*-xylyl Me ether under Friedel-Crafts conditions give mainly 2,4,5-$Me_2(HO)C_6H_2Bz$, *i. e.*, the Bz radical goes *m* to the MeO group. Were R.'s contention correct, 4-*m*-xylyl acetate, under Fries conditions, should give 2,4,5-$Me_2(HO)C_6H_2Ac$, while in practice it gives, as the only recognizable product, 3,5,2-$Me_2(HO)C_6H_2Ac$. When a mixt. of the acetate and Me ether of 4-*m*-xylenol is warmed with $AlCl_3$ in $PhNO_2$, the ether is unaffected and the acetate gives 3,5,2-$Me_2(HO)C_6H_2Ac$, *i. e.*, no acetate reacts in the sense to be anticipated from R.'s theory. The main support for the latter theory is the formation from a mixt. of 2,4-$ClMeC_6H_3OAc$ and *p*-MeC_6H_4OBz (Fries conditions) of 3,5,2-$ClMe(HO)C_6H_2Bz$ and 5,2-$Me(HO)C_6H_3Ac$, in addn. to the normal products, *viz.*, 3,5,2-$ClMe(HO)C_6H_2Ac$ and 5,2-$Me(HO)C_6H_3Bz$. A. and M. have obtained the same results but have also isolated some 2,4-$ClMeC_6H_3OBz$ It is shown that exchange of acyl groups frequently occurs when phenol esters of different acids are together submitted to Fries conditions, although this does not necessarily take place with every pair. Thus, a mixt. of PhOAc and *p*-$MeC_6H_4CO_2CH_2Cl$ gives only 2- and 4-HOC_6H_4Ac and 5,2-$Me(HO)C_6H_3COCH_2Cl$ and, if mild conditions are employed, even the latter is not formed. Similarly, a mixt. of *p*-MeC_6H_4Ac and 3,4-$ClMeC_6H_3OBz$ gives only traces of hydroxy ketones derived from intermediate reciprocal exchange of acyl radicals. That is, the course of all such reactions is detd. by the nature of the substance concerned (the Bz and $ClCH_2CO$ groups are more firmly attached to O than is the Ac group). A mixt. of 2,6-$Me_2C_6H_3OAc$ and *p*-MeC_6H_4OBz gives xylenol and cresol, together with 5,2-$Me(HO)C_6H_3Ac$ and 5,2-$Me(HO)C_6H_3Bz$. A mixt. of 2,4,6-$Me_3C_6H_2OAc$ and *p*-$MeC_6H_4CO_2CH_2Cl$ gives cresol, 2-hydroxymesitylene, the acetate of the latter and 3,4,5,2-$Me_3(HO)C_6HAc$. *2,6-Dimethyl-4-ethylphenyl chloroacetate*, b_{12} 156°, m. 77–8°, gives a small quantity of 3,5,4-$Me_2(HO)C_6H_2COCH_2Cl$. A mixt. of the same chloroacetate with *p*-MeC_6H_4OAc ($AlCl_3$; 150°) gives 5,2-$Me(HO)C_6H_3Ac$ and unchanged chloroacetate, together with a trace of an *o*-hydroxyphenacyl chloride (?). To det. whether in fact an acyl group attached to the O atom of 1 phenol can enter the nucleus of another phenol mol., mixts. of phenol ethers and esters have been heated with $AlCl_3$. When 2,6-$Me_2C_6H_3OMe$ and *p*-MeC_6H_4OAc are so taken, the products are xylenol, cresol, 5,2-$Me(HO)C_6H_3Ac$ and 3,5,4-$Me_2(HO)C_6H_2Ac$. With a mixt. of 2,4,6-$Me_3C_6H_2OMe$ and *p*-$MeC_6H_4CO_2CH_2Cl$, the 2 free phenols, $ClCH_2CO_2H$ and unchanged ethers are the sole products. Had R. substitution occurred, ketones derived from the ethers should have been formed. Other evidence is obtained which shows that reciprocal exchange of acyl groups occurs in some cases under the conditions of a Fries change. 2-Hydroxymesitylene and *p*-MeC_6H_4OBz or the acetate of

the former and p-MeC_6H_4OH, do not interact in absence of catalysts at 200°, while a mixt. of the last 2 substances, when heated at 150° for 0.75 hr. in the presence of $AlCl_3$ affords only 5,2-Me(HO)C_6H_3Ac and hydroxymesitylene. On the other hand, when a mixt. of 2-hydroxymesitylene and p-MeC_6H_4OBz is heated for 0.25 hr. at 150° with $AlCl_3$, 2,4,6-$Me_3C_6H_2OBz$ is formed, together with the 2 free phenols and 5,2-Me(HO)-C_6H_3Bz, while under similar conditions a mixt. of 2,4,6-$Me_3C_6H_2OAc$ and p-MeC_6H_4-OBz affords some of the benzoate of the mesitylenol, together with BzOH, 5,2-Me(HO)-C_6H_3Bz and 5, 2-Me(HO)C_6H_3Ac. A mixt. of 2,4,6-$Me_3C_6H_2OAc$ and 3,4-$ClMeC_6H_3OBz$ gives free phenols, 3,5,2-ClMe(HO)C_6H_2Ac, 3,5,2-ClMe(HO)C_6H_2Bz and the 2,4,6-$Me_3C_6H_2OBz$. Since reciprocal esterification under Fries conditions would explain R.'s test expt., it is concluded that the Fries rearrangement is an intra- and not an inter-mol. change. C. J. West

Alkylation and acylation in the presence of titanium tetrachloride. G. Stadnikov and L. Kashtanov. Lab. Coal Research, Moscow. *Ber.* **61B**, 1389–91(1928); cf. *C. A*. **22**, 1774.—Zonev has shown that certain compds. of $SnCl_4$ with ethers in C_6H_6 decomp. in such a way that 1 of the alkyl groups of the ether replaces one or two H atoms of the C_6H_6 nucleus, and S. and his co-workers have found that ketones of the thiophene series can be synthesized from acyl chlorides and thiophenes with $SnCl_4$. It was of interest to det. whether $TiCl_4$ can be used for analogous syntheses. $PhCH_2$-OEt with $TiCl_4$ in C_6H_6 decomps. into $PhCH_2Cl$, which reacts further with the C_6H_6 to form mono- and disubstituted benzenes. That this is the mechanism of the reaction is confirmed by the fact that preformed $PhCH_2Cl$ reacts in the same way with C_6H_6 in the presence of $TiCl_4$. iso-AmOAc and iso-AmOBz, on the other hand, do not react with C_6H_6, and neither does $(iso\text{-}Am)_2O$. Nor was it possible to prep. Ph_2CO from BzCl, C_6H_6 and $TiCl_4$, whereas thiophene gives benzothienone almost quant. C_6H_6 as such does not react with $TiCl_4$. From 72 g. $PhCH_2OEt$, 350 g. C_6H_6 and 50 g. $TiCl_4$ gently boiled 10 hrs. were obtained 46.5 g. CH_2Ph_2, 17.8 g. m- and p-$C_6H_4(CH_2Ph)_2$ and 8.7 g. residue; 20 g. $PhCH_2Cl$, 200 g. C_6H_6 and 29 g. $TiCl_4$ gave 9.4 g. CH_2Ph_2, 1.8 g. m- and 1.6 g. p-$C_6H_4(CH_2Ph)_2$ and 6.6 g. residue. C. A. R.

Aromatic hydrocarbons in the naphtha of Turzowá. Hugo Novák and Jos. Hubáček. *Chemický Obzor* **1**, 10–5; *Chem. Zentr.* **1927**, II, 1318.—N. and H. det. the aromatic hydrocarbons in a crude oil from Turzowá. The phys. properties and the results of Engler-Ubbelohde's distn. test are given. Having compared different methods N. and H. finally employ sulfonation for isolating the aromatic hydrocarbons from the resp. fractions obtained by distn. of the naphtha when raising the temp. in intervals of 10°. The naphtha distg. at and below 165° consists of 16% of aromatic hydrocarbons; this value equals 3.8% of the original crude oil. Of all the aromatic hydrocarbons present, PhH, which prevails in the fractions up to 105°, makes up 25%, and MePh 13%. Xylenes make up the biggest part of this naphtha with 40%. The rest of 22% are higher (b. p. over 150°) homologous compds. of PhH, which were not identified more exactly. The distillates between 175° and 205° are practically free of aromatic hydrocarbons. G. Schwoch

Alkali organic compounds. W. Schlenk and Ernst Bergmann with Bertha Benedikt, Ottilie Blum, Celina Bresiewicz, Ilse Rodloff, Johannes Appenrodt, Karl Ehninger, Hans Ender, Robert Israel, Angelo Knorr, Theodor Köhler, Alfred Michael, Eugen Müller, Ernst Rubens, Wilhelm Schmidt-Nickels, Wilhelm Stoffers, Alfred Wiegandt and Harry Willstädt. **I. Products of the addition of alkali metal to several carbon-carbon linkages.** *Ann.* **463**, 1–97 (1928); cf. *C. A*. **8**, 1580.—In the addn. of Na or other alkali metals to the C : C bond, 2 types of compds. are to be distinguished: (I) $Ph_2C{:}CPh_2$ gives $Ph_2CNaCNaPh_2$ and (II) $2Ph_2C{:}CH_2$ gives $Ph_2CNaCH_2CH_2CNaPh_2$. Besides the 2 cases, which show that an unsatd. C atom is capable of adding Na only if it is linked to an aryl group, several cases are found in which the C atom binds alkali, even if not attached to an aryl group. In these cases the C atom is associated with an unsatd. group. Under definite conditions the C atoms of the C_6H_6 ring add Na; $C_6H_4Ph_2$, for example, forms the complex $PhNaC_6H_4NaPh$. In the following work Na and Li were used; in most cases Li adds more rapidly to the unsatd. C atom. H_2O and the alcs. hydrolyze the metal complexes, replacing the metal by H; CO_2 replaces the Na by the CO_2Na group; with MeI, compds. of type I give the original hydrocarbon, while with those of type II, substitution occurs; with Hg, compds. of type I lose Na, forming the original hydrocarbon and Na-Hg, while compds. of type II do not react; R'NCS reacts with compds. of type I to give the original hydrocarbon and R'NNaCSCSNNaR', while with compds. of type II, substitution occurs, the group (S:)CNNaR' being introduced, which on hydrolysis with H_2O yields thioamides. With PhNCO, polymeriza-

tion occurs (formation of $(PhNCO)_3$). $Ph_2CNaCNaPh_2$ (III) in Et_2O, shaken with Hg, gives $Ph_2C{:}CPh_2$ (IV), but not quant. The alkali compds. of anthracene and Hg gives the pure hydrocarbon, while the di-Na deriv. (V) of $Ph_2C{:}CHCH{:}CPh_2$ gives $Ph_2C{:}CH_2$. III and EtNCS give IV and the compd. $C_6H_{10}N_2S_2Na_2$; PhNCS likewise regenerates IV. V and EtNCS give, after hydrolysis of the Na salt with H_2O, the *dithioethylamide* of *1,1,4,4-tetraphenylbutane-1,4-dicarboxylic acid*, m. 223°; hydrolysis with concd. HCl at 160° gives the free acid, m. 290° (decompn.). III and PhBr give IV and Ph_2; BzH gives IV, BzONa and $PhCH_2OH$; furfural gives IV, Na pyromucate and furyl alc.; $(HCHO)_3$ gives IV, HCO_2Na and *2,2,3,3-tetraphenylbutane-1,4-diol*, m. 187°; BzOPh gives IV, Ph_2 and BzONa; other esters react in an analogous manner; BzCl gives IV and benzil; α-$C_{10}H_7COCl$ gives IV and α,α'-naphthil; $ClCO_2Me$ gives IV and $(CO_2Me)_2$; phorone gives IV and $(Me_2CHCH_2)_2CO$; $PhNH_2$ gives IV and PhNHNa; NO gives IV and $Na_2N_2O_2$; NH_3 and CO do not react with III; SO_2 gives $Ph_2C(SO_2Na)C(SO_2Na)Ph_2$. V and BzH give *1,2,2,5,5,6-hexaphenylhexane-1,6-diol*, sinters 176°, m. 212°; furfural gives *1,6-difuryl-2,2,5,5-tetraphenylhexane-1,6-diol*, m. 212–3°. BzOPh gives *1,4-dibenzoyl-1,1,4,4-tetraphenylbutane*, m. 195–6°. BzCl gives *1,2,2,5,5-pentaphenyl-1-hydroxycyclopentane*, m. 179° (10% yield) and the *Bz deriv.*, m. 240°. $COCl_2$ gives *2,2,5,5-tetraphenylcyclopentan-1-one*, m. 176°. Phorone gives $(Ph_2CHCH_2)_2$. NOCl gives $(Ph_2C(OH)CH_2)_2$, m. 204°, which, crystd. from AcOH, apparently forms an inner anhydride, m 190–1°. In the systematic investigation of alkali addn. to the C·C bond, it was found that no reaction occurs with $Ph_2C{:}CHMe$, $Ph_2C{:}CMe_2$, $PhCH{\cdot}CMe_2$, $PhMeC.CMe_2$ or $Ph_2C{:}C(CH_2Ph)_2$; this behavior is explained by the assumption that the double bond is not in the place as indicated by the formulas given, for in all other cases the C:C bond adds Na if it is linked with 2 Ph groups. If the compd $Ph_2C{\cdot}CMe_2$ is ascribed an isomeric constitution, $Ph_2CHC{:}CH_2Me$, no alkali addn would be expected; this assumption is supported by the observation that $Ph_2C{\cdot}CHCH_2Ph$ does not add Na but does react when 1 H atom is substituted and that $Ph_2C{\cdot}CMe_2$, which does not react with Na, slowly reacts with Li, giving a brown alkali complex. $(Me_2NC_6H_4)_2C{:}C(C_6H_4NMe_2)_2$ reacts quickly with Na, giving a bluish green powder; EtOH gives $[(Me_2NC_6H_4)_2CH]_2$, m 334°; CO_2 gives the *Na salt*, $C_{36}H_{40}O_4N_4Na_2$, pale yellow, unchanged at 300°, which gives a deep dark blue aq. soln., the color disappearing on heating. *Dibiphenylmethylcarbinol*, from the ketone and MeMgI, m. 147°, gives a bluish red soln. in concd. H_2SO_4; warming with AcOH and H_2SO_4 on the H_2O bath gives *dibiphenylethylene*, m. 211°; in Et_2O Na gives a deep blue soln., the Na compd. sepg. as crystals with a metallic luster, CO_2 gives *α,α'-tetrabiphenyladipic acid*, does not m. 300°; Hg gives the original hydrocarbon; EtOH gives *1,1,4,4-tetrabiphenylbutane*, m. 236°. $Ph_2C{\cdot}CHPh$ gives a brownish black Et_2O soln., decompd. by EtOH to Ph_2CHCH_2Ph, m. 56°; CO_2 gives the *anhydride* of *triphenylsuccinic acid*, m. 115°. Ph_2C CPhMe gives a blood-red Et_2O soln. with Na, decompd. by EtOH to $Ph_2CHCHPhMe$, m. 73–5°; Li behaves similarly. $Ph_2C{:}CHMe$ does not react with Na; K gives a very little dark ppt, which reacts with CO_2 to give a *compd.*, $C_{17}H_{14}O_3$, m 164° and a 2nd *compd.*, $(C_{16}H_{16}O_2)_n$, m. 259°. Me_2CHCO_2Me and PhMgBr give *diphenylisopropylcarbinol*, b_{12} 169–70°, m. 47°; the action of HCl, followed by C_5H_5N, gives *1,1-diphenyl-2,2-dimethylethylene*, $Ph_2C{:}CMe_2$ or $Ph_2CHCMe{:}CH_2$, b_{14} 152–3°; Li gives after 4 weeks a brown soln, which reacts with PhNCS to give the *thioanilide* of *diphenyl-2-propenylacetic acid*, pale yellow, m. 161°. *1,3,3-Triphenyl-2-benzylpropan-3-ol*, m. 100°; *1,1-diphenyl-2,2-dibenzylethylene*, m. 78°, results from the chloride and C_5H_5N; this does not react with Na. $Ph_2C{:}CHCH_2Ph$ or $Ph_2CHCH{\cdot}CHPh$, b_{10} 222°, reacts with Na during 2 months to give a red ppt., decompd. by EtOH to give the original hydrocarbon, thus indicating substitution, not addn. Ph_2C $CHCHPh_2$ reacts very slowly with Na; Li reacts much more quickly, giving a dark brown soln.; decompn. with EtOH gives *1,2,3-triphenyldihydroindene*, m. 153°; CO_2 gives *1,2,3-triphenyldihydroindenecarboxylic acid*, m. 271°; *Me ester*, m. 151°. With soda-lime the acid gives the *compd.*, $C_{27}H_{22}$, m. 126°. That only 1 Li atom reacts is further shown by the formation with EtNCS of the *compd.* $C_{30}H_{27}NS$, m. 193°. The Li compd. and I give $Ph_2C{:}CHCH{\cdot}CPh_2$, m. 200°, Ph_2CH_2 and a hydrocarbon, m. 221°. $Ph_2C{\cdot}CPhCN$ and Na in Et_2O give a bluish violet, then brownish black and finally a deep blood-red soln., decompd. by EtOH to Ph_2CHCH-PhCN, m. 102–3°. PhCN and Na give a dark red soln., decompd. by EtOH to cyaphenin, $(PhCN)_3$, and a green oil, whose *perchlorate* has the compn. $C_7H_7N\ HClO_4$. Diphenylfulvene reacts almost immediately with Na in Et_2O, giving a clear red soln., decompd. by EtOH to *3-benzohydrylcyclopentadiene*, m. 36.5°, and by CO_2 to the *acid*, $(CH{:}CH)_2C(CO_2H)C(CO_2H)Ph_2$, m. 173–5° (decompn.). Dimethylfulvene and Na in Et_2O give a red ppt., which reacts with EtOH to give $[(CH{:}CH)_2C(CO_2H)CMe_2]_2$,

whose *Me ester* m. 194°. Diphenylbenzofulvene and Na give a dark red Et_2O soln., which reacts with EtOH to give 3-benzohydrylindene, m. 114°, and with CO_2 to give *1-[diphenylmethanecarboxylic acid]-indene-1-carboxylic acid,* m. 177° (decompn.). $(C_6H_4)_2C:C(C_6H_4)_2$ and Na give a deep reddish yellow soln., decompd. by EtOH to $(C_6H_4)_2CHCH(C_6H_4)_2$, m. 240°, and by CO_2 to *dibiphenyleneethanedicarboxylic acid,* m. 240°. $(C_6H_4)_2C:CHPh$ and Na give an insol. brick-red powder, decompd. by EtOH to *sym-diphenyldifluorenylethane,* m. 321°, and by CO_2 to *β,β'-diphenyl-α,α'-dibiphenyleneadipic acid,* m. 240° (decompn.). Furfurylidenefluorene and Na give a reddish brown addn. product, which yields with EtOH *sym-di-α-furyldi-9-fluorenylethane,* m. 238–42° and gives an orange-red color with H_2SO_4. Cinnamylidenefluorene and Na give a reddish brown addn. product, decompd. by EtOH to *sym-distyryl-di-9-fluorenylethane,* m. 254–5°; this is identical with the compd. obtained by Thiele and Henle (*Ann.* **347**, 303(1906)) by reduction with Al-Hg and moist Et_2O. There also results a *hydrocarbon,* m. 204°. Dixanthylene and Na give a bright scarlet-red soln. which is decompd. by EtOH to 9,9'-dixanthyl and by CO_2 to *9,9'-dixanthyl-9,9'-dicarboxylic acid,* pale yellow, decomps. 189°; the *Na salt* is yellow. $(PhCH:CH)_2C:CPh_2$ gives a wine-red color with Na in Et_2O, decompd. by EtOH to *1,5-diphenyl-3-benzohydryl-1,4-pentadiene,* pale yellow, m. 151–2°, and by CO_2 to *1,1-distyryl-2,2-diphenylethane-1,2-dicarboxylic acid,* m. 215° (decompn.). $(PhCH:CHCH\cdot CH)_2C:CPh_2$ and Na give at first a deep green, then a greenish blue soln., decompd. by EtOH to *1,9-diphenyl-5-benzohydryl-1,3,6,8-nonatetraene,* m. 140°, and by CO_2 to the corresponding *dicarboxylic acid,* $(PhCH.CHCH:CH)_2C(CO_2H)C(CO_2H)Ph_2$, yellow, m. 127° (decompn.). $(Me_2C:CH)_2C\cdot CH_2$ and Na give a deep reddish yellow soln., giving with EtOH *2,9-dimethyl-4,7-di-[β,β-dimethylvinyl]-2,8-decadiene,* pale yellow, b_{58} 195–6°; CO_2 gives the *Na salt,* $C_{22}H_{32}O_4Na_2$, pale yellow. PhC ⋮ CPh is best obtained by oxidizing $(PhCNNH_2)_2$ with HgO; Na gives a dark brown soln. in Et_2O, decompd. by EtOH to a compd. m. 295°; the reaction is better studied with Li, which gives a dark brown soln. and ppt; EtOH decomps. this to *1,2,3-triphenylnaphthalene,* m. 151°, which is not catalytically reduced by Pd-$BaSO_4$ but with Na and AmOH gives an amorphous product, m. 75°, contg. 4 additional H atoms; from a reaction product which had stood several years, an *isomer,* m. 192°, was isolated, which is also not catalytically reduced. CO_2 gives *2,3,4-triphenylnaphthalene-1-carboxylic acid* (VI), m. 258° (decompn.); the C_6H_6 mother liquor gives the *anhydride* of *3,4-dihydro-2,3,4-triphenylnaphthalene-3,4-dicarboxylic acid,* m. 270°. PhSCN gives the *thioanilide* of VI, yellow, m. 280–1°. The action of Hg or I upon the Li complex gives the *hydrocarbon,* $C_{28}H_{20}$, m. 227°. $Ph_2C\cdot CCl_2$ or $Ph_2C:CBr_2$ with Li (concd. soln.) gives a *hydrocarbon,* $C_{28}H_{22}$, m. 183°, catalytically reduced to the *hydrocarbon,* $C_{28}H_{24}$, m. 182° (also obtained by the action of Li and hydrolysis); in dil. soln there results the hydrocarbon $C_{28}H_{20}$, m. 152°, transformed by Li and hydrolysis to the hydrocarbon, $C_{28}H_{20}$, m. 192°. *Anisildihydrazone,* m. 118°, on oxidation gives $MeOC_6H_4C$ ⋮ CC_6H_4OMe, m. 145°; concd H_2SO_4 gives a bluish red color; Li reacts very slowly. Diphenyldiacetylene is polymerized by Li or Na. The action of Li upon phenanthrene (purified through the picrate) gives a dark brown, Et_2O-insol. product, transformed by EtOH into a liquid *dihydrophenanthrene* (VII), b_{15} 168–70°, catalytically reduced by Pd-$BaSO_4$ to a mixt. of 2 *tetrahydrophenanthrenes,* b_6 140–5° and 145–9°. From the distn. residue of VII there is isolated a new *dihydrophenanthrene,* m. 71–3°. The action of Na upon phenanthrene gives a reddish violet soln., giving with CO_2 *9,9',10,10'-tetrahydro-9,9'-diphenanthryl-10,10'-dicarboxylic acid,* m. 226°. Diphenylphenanthrene and Li (or Na) give a brown-red soln., decompd. by EtOH to *9,10-dihydro-9,10-diphenylphenanthrene,* m. 130–1°, and by CO_2 to the *anhydride* of the corresponding *9,10-dicarboxylic acid,* pale yellow, m. 221°. $C_{10}H_8$ gives with Li a reddish violet soln. and a dark brownish violet ppt., yielding with EtOH 1,4-dihydronaphthalene, m. 28°, and with CO_2 the corresponding *1,4-dicarboxylic acid,* m. 226–7°. Ph_2 and Li give a brown ppt., yielding with EtOH a *dihydrodiphenyl,* b_{10} 110° catalytically reduced to cyclohexylbenzene. CO_2 gives *1,4-dihydrodiphenyl-1,4-dicarboxylic acid,* m. 266°. *p*-$C_6H_4Ph_2$ and Na give a grayish black ppt., decompd. by CO_2 to *1,4-diphenyl-2,5-cyclohexadiene-1,4-dicarboxylic acid,* sinters 240°, m. 264° (decompn.). 1,2,4,5-$C_6H_2Ph_4$ gives a deep dark blue soln. with Na, decompd. by EtOH to the *1,2-dihydro deriv.,* m. 208–10°; Pd and H give $C_6H_2Ph_4$. CO_2 gives an *acid,* $C_{32}H_{24}O_4$, m. 230° (decompn.); the soln of the Na salt is easily changed to $C_6H_2Ph_4$. **II. New knowledge in the field of the stereochemistry of carbon.** *Ibid* 98–227.—PhCH:CHCH:CHPh and Na give a dark brownish violet ppt. [PhCHNaCH:CHCHNaPh]; with EtOH this yields a *1,4-diphenyl-2-butene,* b_{13} 176°, isomeric with the known compd., m. 45° (probably *cis-trans* isomerism); with CO_2 there results *1,4-diphenyl-2-butene-*

1,4-dicarboxylic acid, m. 220°; Hg or dry air gives the original hydrocarbon. Li behaves similarly to Na. $Ph_2C:CHCH:CPh_2$ and Na give a dark bluish violet soln., which gives with EtOH *1,1,4,4-tetraphenyl-2-butene* (I), m. 140.5°, does not decolorize Br; reduction gives $(CH_2CHPh_2)_2$, m. 119°. CO_2 gives the corresponding *1,4-dicarboxylic acid,* m. 262° (decompn.), which decolorizes $KMnO_4$ in Na_2CO_3; *di-Me ester,* m. 148–8.5°. MeI and Hg give $Ph_2C:CHCH\cdot CPh_2$. Li behaves similarly. Reduction of $Ph_2C:CHCH:CPh_2$ with Na-Hg gives I. $Ph_2C:CHMgBr$ and $HgBr_2$ give 40% of *bis[β,β-diphenylvinyl]mercury* (II), m. 140.5°, and some *β,β-diphenylvinylmercuric bromide,* m. 158–9°; the latter is the principal product with a larger amt. of $HgBr_2$. II and Na after 8 days give a brownish violet product, which with CO_2 gives the above acid, m 262°; EtOH gives an *isomer* of I, m. 123–4°. $(C_6H_4)_2CNaCNa(C_6H_4)_2$ in Et_2O has Λ 7.1 × $10^{-5}\Omega^{-1}$ per mol. in cc.; $(PhCH:CH)_2CNaCNaPh_2$, 1.6 × 10^{-8}; the latter was the more deeply colored. PhCH:CHPh gives a di-Na compd., yielding with CO_2 the *acid,* $C_{16}H_{14}O_4$, m. 229–30° (decompn.); *di-Me ester,* m. 219°. Hg gives PhCH:CHPh. Li gives a reddish brown product, which gives with EtOH $(PhCH_2)_2$ and with Hg PhCH:CHPh. CO_2 gives the *acid,* $C_{16}H_{14}O_4$, m. 241° (decompn.); *di-Me ester,* m. 191°. The acid m. 229° is *meso-*$(CHPhCO_2H)_2$. K behaves similarly to Na. Iso-stilbene and Li give a reddish brown soln., giving with Hg stilbene and with CO_2 the acid, m. 241°. Na gives a bluish violet soln. and a steel-blue ppt., which gives with EtOH or Hg stilbene and with CO_2 the acid, m. 229°. $(CPhMe)_2$ and Na give a yellow-brown soln. after 5 days; EtOH gives $(CHPhMe)_2$, m. 124°, also obtained by catalytic reduction of $(CPhMe)_2$. CO_2 gives $(HO_2CCPhMe)_2$, which does not m. 296°. The Li compd. forms a brownish violet ppt., which gives with EtOH the same compd. as the Na compd., but with CO_2 gives an isomeric *sym-diphenyldimethylsuccinic acid,* m. 296°. Hg gives the original hydrocarbon. $Ph(PhC_6H_4)CO$ (50 g.) and 43 g. PCl_5, heated 1 hr. at 160°, give 56 g. of the *dichloride,* m. 72°; 30 g. of this and 60 g. Cu bronze in 300 cc. C_6H_6, heated 4 hrs., give 19 g. *sym-diphenyldibiphenylethylene,* m. 255°, and 16 g. of an isomeric *hydrocarbon,* m. 218°. Either isomer with Na gives a reddish violet compd., which yields with EtOH *sym-diphenylbiphenylethane,* m. 247°, and the *isomer,* m. 205–6°. Catalytic reduction of *p,p'*-dimethoxytolan in 1,4-dioxane gives a mixt. of *p,p'-dimethoxyisostilbene,* m. 37°, and the dibenzyl deriv., m. 123°; on distn. at 14 mm., some dimethoxystilbene, m. 212–3°, is formed, which also results by the action of Hg upon the Li deriv. The di-Na deriv. of dihydroanthracene gives with CO_2, as has been previously described, a 9,10-dihydroanthracene-9,10-dicarboxylic acid, m. 286° (decompn.), which is termed the α-acid (III); if the aq. soln. of the Na salt is heated before pptn. with acid, there results the *β-acid* (IV), which crysts. with 1 H_2O, which is lost at 16 mm. and 113°, and it then m. 294° (decompn.); a small amt. of IV may be extd. with Et_2O from the aq. filtrate from III. The Li compd. with SO_2 gives a 3rd isomer, termed the *γ-acid* (V), which results whether the aq. soln. is or is not heated, and m. 297° (decompn.). III with CH_2N_2 gives a *di-Me ester,* m. 162.5–3°; IV and V give the same *di-Me ester,* m. 163.5–5°; the 2 esters are characterized by their different behavior toward the cathode rays. IV and V differ in that while V appears to cryst. with H_2O, this is lost at room temp., while the H_2O of crystn. of IV is stable at room temp. The 2 acids also differ in the relative ease of transformation into III. Esterification of III with MeOH and HCl gives a mixt. of the α- and β-esters. Heating the α-ester at 200° gives the β-ester. The α-9,10-dihydroanthracene-9-carboxylic acid, m. 207°, resulting from the Na deriv. of anthracene and CO_2, gives a *Me ester* (VI), m. 94–6°; with a higher concn. of the anthracene, there results the β-acid (see below) and *9,9',10,10'-tetrahydro-9,9'-bianthryl-10,10'-dicarboxylic acid,* isolated as the *di-Me ester,* m. 267°; the free acid does not m. 370°. Reduction of anthroic acid gives *β-9,10-dihydroanthracene-9-carboxylic acid,* sinters 182°, m. 197°; reduction of the corresponding ester gives VI. 9,10-Diphenylanthracene, for which a method of prepn. is given, is reduced by Na-Hg or Na or AmOH to a dihydro deriv., m. 208°; Na gives a deep blue, then violet soln , which yields with EtOH a *dihydro deriv.* (VII), crystg. as needles, m. 199°, and as tablets, m. 190°, a mixt. of which m. 175°; these are polymorphic forms. Both dihydro derivs. give the same *tetrahydro deriv.*, does not m. 300°. The action of CO_2 upon the Na deriv. gives the *α-9,10-diphenyl-9,10-dihydroanthracene-9,10-dicarboxylic acid,* m. 299° (decompn.), if the aq. soln. of the Na salt is heated and then cooled before acidification; if the soln. is acidified without heating, there results the *β-acid* (VIII), m. 277° (decompn.); esterification gives the same *di-Me ester,* m. 201°. The Li deriv. and CO_2 give the *γ-acid* (IX), m. 282°, which also gives the above di-Me ester. *9,10-Diphenyl-9,10-dihydro-9,10-dimethoxyanthracene,* m. above 300°; Na and CO_2 give the above β-acid; Li and CO_2 give the γ-acid.

9-Methylanthracene gives at first a deep blue soln. with Na, changing to green; EtOH gives methyldihydroanthracene. 9-Phenylanthracene, m. 152°, from phenylanthrone on reduction with Na and AmOH, gives α-phenyldihydroanthracene, m. 87°, also obtained from the action of Na and EtOH. 9-Phenylanthracene from anthrone is reduced by Na and AmOH to β-phenyldihydroanthracene, m. 123°, but Na, followed by EtOH, gives the α-deriv., m. 87°. The β-deriv. with Na gives a brownish yellow soln. which yields with EtOH the α-deriv. The 9,9′-bianthryl, m. above 360°, on reduction with Na and AmOH, gives a tetrahydro deriv., m. 255°; Na gives a deep violet addn. product, decompd. by EtOH to the same tetrahydro deriv., while CO_2 gives the *tetra-Na salt*, $C_{32}H_{18}O_8Na_4$. Ph_2CHNa and 9-bromoanthracene give a little *9,9′-bianthryl*, m. 304°, reduced by Na and AmOH to the above tetrahydro deriv. Phenylanthrone (7.5 g.) and excess PhMgBr give 5.5 g. *9,10-diphenyl-9,10-dihydro-9-hydroxyanthracene*, m. 202–3°; heated in $C_6H_4Me_2$ with K and MeI, there results nearly quant. the *Me ether*, m. 226°. The action of K in $C_6H_4Me_2$ for 2 hrs., followed by MeI, EtI, Me_2CHI, $ClCH_2OMe$, $PhCH_2Cl$, or best, Me_3CCl, gives *diphenylanthracene* (X), m. 214°, isomeric with the yellow form, m. 247°. Na gives a dirty yellow-brown soln. yielding VII with EtOH and VIII with CO_2. Hg gives X. The Li compd. with Hg gives X, with CO_2 IX. Phenylanthrone and o-MeC_6H_4MgBr give *9-phenyl-10-tolyl-10-hydroxy-9,10-dihydroanthracene*, m. 201°, colored deep green by concd. H_2SO_4; K and Me_3CCl give *9-phenyl-10-o-tolylanthracene*, m. 172–3° and showing in boiling BzOEt a reversible yellow color. Phenylanthrone and MeMgI give *9-phenyl-10-methyl-10-hydroxy-9,10-dihydroanthracene*, pale red, m. 162°; K and Me_3CCl give the known 9-methyl-10-phenylanthracene, m. 116°. PhMgBr and 1-methylanthraquinone give *1-methyl-9,10-diphenyl-9,10-dihydro-9,10-dihydroxyanthracene*, m. 236°; with HCO_2Na and HCO_2H this gives *1-methyl-9,10-diphenylanthracene*, yellow, m. 194°. The 2-Me deriv. was similarly prepd. Phenylmethoxyanthrone and o-MeC_6H_4MgBr give *9-phenyl-10-o-tolyl-9-methoxy-10-hydroxy-9,10-dihydroanthracene*, m. 168°; *9-phenyl-o-tolylanthracene*, pale yellow, m. 257–8°; the corresponding *m-tolyl derivs.* m. 209–10° and 182–3°, resp. Fluorene and EtLi give $(C_6H_4)_2CHLi$, orange colored; Ph_3CNa gives the Na deriv., which is sol. in Et_2O (yellow soln.); with CO_2 either salt gives *β-fluorene-9-carboxylic acid*, m. 232°; both this and the α-acid, m. 222°, give the same *Me ester*, m. 63°, and also the di-Me ester of dibiphenylenesuccinic acid, m. 234°. The latter acid with MeOH and H_2SO_4 gives after 8 days, the Me ester, m. 63°. The Li salt and Ph_2CHBr in C_6H_6 give 9-benzohydrylfluorene, m. 217°; the Na salt gives the same compd. However, Ph_2CHNa and 9-chlorofluorene give the isomeric *compd.*, m. 187°, whose constitution is established by shaking with K for 4 weeks and then treating with CO_2, giving α-fluorene-9-carboxylic acid, Ph_2CHCO_2H and Ph_2CH_2. *Fluorenone di-Me acetal*, m. 87–8°. Na gives the *Na deriv.* of *methoxyfluorene*, red prisms, which yields with CO_2 *9-methoxyfluorenecarboxylic acid*, m. 172–3°; the Me ester m. 124°, and on sapon. gives the isomeric *acid*, m. 192° (decompn.). The Li salt behaves similarly. The Na salt and MeI give 9-methyl-9-methoxyfluorene, m. 92–3°; with Na there results a golden yellow ppt., with Li a brownish yellow powder; with CO_2 both give the above acid, m. 193°. *Phenylfluorenol benzyl ether*, m. 141.5°, gives the same acid. Ph_2CO and Na in Et_2O, shaken 10 days and then treated with Ph_2CCl_2, give α-benzopinacolin, m. 207°. Fluorenone and Na give a green soln.; Ph_2CCl_2 gives *9,9-diphenyl-10-phenanthrone*, m. 193–4°; fluorenone dichloride gives 9,9-biphenylene-10-phenanthrone, m. 257°. $Ph_2C(ONa)Na$ and 9,9-dichlorofluorene in Et_2O give 2 kinds of reaction products (conditions for each not detd.); if the Et_2O residue is solid, there are obtained 2 stereoisomeric *biphenylenediphenylethylenes*, m. 224–5° and 213°, sepd. by crystg. from benzine; if the residue is oily, the product is *biphenylenediphenylethylene oxide*, m. 228°; the mother liquor gives a mixt. of the 2 hydrocarbons. Reduction of the hydrocarbons gives 9-benzohydrylfluorene, m. 214°. The lower-melting isomer, treated with Na and then with Hg, gives the higher-melting compd. The oxide, heated with AcCl for 6 hrs., gives a mixt. of the 2 hydrocarbons. Fluorenone and iso-PrMgCl give *9-fluorenyldimethylcarbinol*, m. 124°; the Et_2O soln., satd. with HCl at −20° and then heated with C_5H_5N for 3 hrs., gives *biphenylenedimethylethylene*, light yellow, m. 113°, which is very unstable. The Li deriv. of fluorene and Ph_2CO give a mixt. of $(C_6H_4)_2C{:}CPh_2$, m. 213–4°, and $(C_6H_4)_2CHC(OH)Ph_2$, m. 213–4°. Diphenylindone and PCl_5 give the *compd.*, $C_{21}H_{14}OCl_2$, m. 135–6°; 5 g. of the indone, 3.5 g. $PhNH_2$ and 0.2 g. $PhNH_2.HBr$, heated 10 min., give the *compd.* $C_{27}H_{19}N$, brown, m. 201°. *Benzophenone d-bornylimide*, m. 170°, b_{14} 215–8°, [α] 7.57° (0.3435 g. in 10 cc. $CHCl_3$), results by heating Ph_2CO, *d*-bornylamine and a little dil. HBr at 160° for 0.5 hr. Catalytic reduction of diphenylindone with Pd-$BaSO_4$ gives a mixt. of *2,3-diphenyl-1-hydroxydihydroindene*, m. 146° (not sharp, because

of oxidation; the colorless soln. in BzOEt turns yellow on heating); and *2,3-diphenyl-1-ketodihydroindene*, m. 100°. *Diphenylindone d-bornylimide*, bright yellow, m. 123°, [α] 124° (0.2422 g. in 10 cc. $CHCl_3$); decompn. with dil. HCl gives the optically active indone, whose phenylhydrazone has [α] −1.85° (0.2710 g. in 10 cc. $CHCl_3$). Catalytic reduction of 1,1,3-triphenylindene with Pd-$BaSO_4$ or with P and HI gives the dihydro deriv., m. 112–3°, while the action of Na, followed by MeOH, gives the isomeric *dihydro deriv.*, m. 133°. 1-Benzohydrylidene-3-phenylindene, reduced with Na and AmOH, gives *1-benzohydryl-3-phenyldihydroindene*, m. 137°. The action of Na, followed by decompn. with EtOH, gives a yellow *compd.*, $C_{28}H_{22}$, m. 171°, which is reduced by Na and AmOH to the compd., m. 137°, and a colorless *compd.*, $C_{28}H_{22}$, m. 131°. Reduction with Na-Hg and EtOH gives the dihydro deriv., m. 171°, and a 3rd *isomer*, $C_{28}H_{22}$, insol. in PrOH, m. 180°. Stereoisomers of indene-1-carboxylic acid could not be obtained. III. **New kind of compound with bivalent carbon.** *Ibid* 228–80.—Directions are given for the prepn. of $Ph_2C:C:CPh_2$; this reacts with Na, K and Li. The compd. with Na seps. as metallic needles; with EtOH this gives $Ph_2CHCH:CPh_2$, m. 125°; with CO_2 there results the *di-Na salt* of a *dicarboxylic acid*, $C_{28}H_{20}O_4Na_2$, which on treatment with H_2O gives the *Na salt*, crystg. with 3 H_2O, of *diphenyl[β,β-diphenylvinyl]acetic acid* (I), m. 179°. The structure of this acid was established by the following synthesis: *Et β-phenylcinnamate*, b_{17} 207°, and PhMgBr give $Ph_2C(OH)CH:CPh_2$; the *Et ether*, m. 104°; Na followed by CO_2 gives the acid, m. 179°. The Na compd. with MeI at −20°, $CH_2(CH_2Br)_2$ and I give $Ph_2C:C:CPh_2$; Hg has no action. $ClCH_2OMe$ gives *1,1,3,3-tetraphenyl-4-methoxy-1-butene* (II), m. 124°. $ClCO_2Me$ gives the *Me ester*, m. 117–8°, of I, also obtained from I and CH_2N_2. EtNCS gives the *thioethylamide* (III) of I, m. 173°. MeI at room temp. gives *1,1,3,3-tetraphenyl-1-butene* (IV), m. 111°. $Ph_2C(OEt)CH:CPh_2$ and Na give the complex $Ph_2C-NaCH:CPh_2$; with MeI this gives IV; $ClCH_2OMe$ gives II, easily reduced to the *butane*, m. 87.5–9°; EtNCS gives III; $CH_2(CH_2Br)_2$ gives the *compd.* $Ph_2C(CH_2CH_2CH_2Br)CH·CPh_2$, m. 120–1°; I gives a *hydrocarbon*, $C_{27}H_{22}$, m. 129–30°, of unknown structure. $Ph_2C·C:CPh_2$ and Li give a deep violet soln., which gives with EtOH *1-benzohydryl-2-phenyl-3,4-benzocyclobutane* (V), m. 184°; the reaction with H_2SO_4 is characteristic, a pale rose color being formed at first, which changes to a bright bluish blood-red; the latter color results at once upon adding a drop of concd. HNO_3. A Br titration of V indicates that less than 1 mol. Br is consumed, but the action of slightly more than 1 mol. Br in $CHCl_3$ gives the *tri-Br deriv.*, m. 212° (decompn.). V and Na give a blood-red soln.; with CO_2 this gives the acid, $C_{27}H_{21}CO_2H$, which does not m. 300°. LiEt and V give $C_{27}H_{21}Li$ and C_2H_6. Catalytic reduction of V gives the *hydrocarbon*, $C_{27}H_{28}$, m. 170°. The Li complex of $Ph_2C:C·CPh_2$ gives with Hg the *hydrocarbon* $C_{27}H_{20}$ (VI), m. 186°. VI is not catalytically reduced, but Na and AmOH or P and HI give a *hydrocarbon*, $C_{27}H_{22}$, m. 167–8°; Na gives an isomeric *hydrocarbon*, m. 103°. Diphenylindone and PhMgBr give 1,2,3-triphenylinden-1-ol, m. 129–30°, reduced by P and HI in AcOH to *1,2,3-triphenyldihydroindene*, m. 153°. The Me ether, m. 153°, shaken with Na for 8 days, gives 1,2,3-triphenylindene, m. 135°. *Diphenylbenzylacetyl chloride*, m. 90–1°, with $AlCl_3$ in CS_2 gives an oily 2,2-diphenylindan-1-one, which with PhMgBr gives *1,2,2-triphenyldihydroinden-1-ol*, m. 172–3°, giving an orange-yellow color with H_2SO_4; P and HI give *1,2,2-triphenyldihydroindene*, m. 142°, also obtained by the action of Ac_2O and H_2SO_4 at 140° upon *1,2,2,3-tetraphenylpropan-1-ol*, m. 141–2°. $PhCH_2C(OH)PhC(OH)Ph_2$, m. 139°, with AcCl gives a mixt. of Ph_3CCOCH_2Ph, m. 111–2°, *1,2,2,3-tetraphenylpropan-1-one*, m. 151° (also obtained from $Ph_2C(CH_2Ph)OMe$, Na and BzCl), and a *compd.*, $C_{27}H_{22}O$ m. 126–7°, probably $\underbrace{C_6H_4.CH_2.C(OH)Ph.CPh_2}$. $MeC_6H_4CPh_2Na$ and CO_2 give *diphenyl-o-tolylacetic acid*, m. 228°, decomps. 240° (*Et ester*, m. 100–1°); *chloride*, m. 86.5–7°; C_5H_5N gives the *anhydride*, $C_{42}H_{34}O_3$, m. 197°. *Me dibenzyl-o-carboxylic acid*, b_{25} 195–6°; PhMgBr gives *o-[β-phenethyl]triphenylcarbinol*, m. 103°; *chloride*, m. 128–30°; quinoline gives *1,1,2-triphenyldihydroindene*, m. 83°. Reduction of benzohydrylideneanthrone with Na and AmOH gives *9-benzohydryl-9,10-dihydroanthracene*, m. 207.5°. $(C_6H_4)_2CHCH_2CO_2Et$, b_{16} 207–9°, with PhMgBr give *1,1-diphenyl-2-fluorenyl-1-ethanol*, m. 121°, which gives a dark reddish brown color with concd. H_2SO_4; the Et_2O soln. satd. with HCl and then boiled with C_5H_5N gives *1,1-diphenylene-3,3-diphenyl-2-propene*, m. 111–2°; concd. H_2SO_4 gives a yellow color; reduction with Na and AmOH gives *1,1-diphenylene-3,3-diphenylpropane*, m. 107°. Phenylmethoxyanthrone (VII) is reduced by Na and AmOH to 9-phenyl-9,10-dihydroanthracene, m. 87–8°. The *hydrazine* of VII m. 142°; concd. H_2SO_4 gives a blood-red color; heated with EtONa at 140°, there results phenylanthracene. 9,10-Diphenyl-

9-methoxy-10-hydroxy-9,10-dihydroanthracene, shaken with Na for 8 days and then treated with MeI, gives the *9-Me deriv.*, m. 183–4°; reduction with P and HI by heating 3 hrs. in AcOH gives *9,10-diphenyl-9,10-dihydro-9-methylanthracene*, m. 171°. **VII** and $PhCH_2MgCl$ give *9-phenyl-10-benzyl-9-methoxy-10-hydroxy-9,10-dihydroanthracene*, m. 151°, giving a deep green color with concd. H_2SO_4; reduction with P and HI gives *9-phenyl-10-benzylanthracene*, m. 151°; on shaking with Na for 3 days, followed by EtOH, there results *9,10-dihydro-9-phenyl-10-benzylanthracene*, m. 119°. **IV. Addition products of sodium to carbon-nitrogen and nitrogen-nitrogen double bonds.** *Ibid* 281–322.—PhMeC:NPh and Na give at first a brick-red color, changing to a deep reddish brown [PhMeCNaNNaPh]; EtOH gives PhMeCHNHPh, b_{11} 170–2°; CO_2 gives a *salt*, which becomes a smear in the air; the free acid could not be isolated. $(C_6H_4)_2C$:NPh gives a brown soln. with Na, from which EtOH gives 9-anilinofluorene, m. 124°; CO_2 gives *9-anilinofluorene-9-carboxylic acid*, crystg. with $1H_2O$, m. 220° (decompn.). PhCH:NEt gives a dark red soln. with Na, from which EtOH gives $PhCH_2NHEt$, b_{15} 82-3°. PhMeC:NCH_2Ph and Na give a brick-red soln.; EtOH gives $PhMeCHNHCH_2Ph$, b_{19} 176°. $(C_6H_4)_2C$:NH and Na give a bluish red soln. (no evolution of H); reaction with CO_2 probably gives $(C_6H_4)_2C(CO_2Na)NHCO_2Na$ and unchanged $(C_6H_4)_2C$:NH; the salt is extd. with H_2O and upon warming gives 9-aminofluorene, m. 257° (decompn.); in 1 decompn. with EtOH, there was isolated difluorenylamine, m 187°. Me_2C:NPh and Na give a greenish yellow soln., which gives with EtOH 2,2,3,3-tetramethylindoline, m. 39°; the Na complex has the formula $PhNNaCMe_2CMe_2NNaPh$. Similarly, MeEtC·NPh and Na give an intensely yellow soln., which gives with EtOH *3-methyl-2,3-diethylisoindole*, pale yellow, b_{12} 152-3°, whose *methiodide*, pale yellow, m. 242°. $(PhCH:N)_2CHPh$ and Na give a red soln., from which a colorless ppt. seps.; with EtOH this gives dihydroamarine (see below). Acridine reacts promptly with Na, giving a yellowish green mass, gradually turning during 5 days to a violet; EtOH gives a mixt. contg. 35% of dihydroacridine, m. 170°, and an insol. product (recrystd. from $PhNMe_2$ with great loss), which may be *tetrahydro-C,C'-biacridyl*, $C_{26}H_{20}N_2$, m. 270°; C_5H_5N gives a colloidal soln.; BzCl gives a *compd.*, $C_{40}H_{28}O_2N_2$, m. 305° and is completely decompd. by heating 12 hrs. with 30% KOH. The Na compd. with CO_2 gives the same high-melting compd. and *9,10-dihydroacridine-9-carboxylic acid*, m. 229° (decompn.). 9-Phenylacridine and Na give a deep bluish violet soln., which, decompd. with EtOH, gives dihydrophenylacridine, m. 162.5°, and with CO_2 gives *9,10-dihydro-9-phenylacridine-9-carboxylic acid*, m. 225–7° (decompn.). Amarine and Na give a light red addn. product, nearly insol. in Et_2O; EtOH gives *dihydroamarine*, m. 274–5°, also obtained by the catalytic reduction of amarine; the *HCl salt*, m. 285°. Lophine and Na give a colorless ppt. giving unchanged lophine on decompn. with H_2O. $PhCOC_6H_4Ph$, transformed into the K or Na salt, and treated with phenazine, yields a quinhydrone of phenazine and its di-K or di-Na salt, deep green or violet; treatment with H_2O gives a *mixt.* of phenazine and dihydrophenazine, blue, m. 224-6°. PhMeC:NN:CPhMe gives a red compd. with Na; the decompn. product with it is an oil; CO_2 gives a *salt*, $C_{20}H_{16}O_8N_2Na_4$. Ph_2C·NN CPh_2 solns. are colored violet-black with Na; EtOH gives *sym*-dibenzohydrylhydrazine, m. 138°; CO_2 gives the *salt*, $C_{30}H_{20}O_8N_2Na_4$. $(C_6H_4)_2C$:NN:C-$(C_6H_4)_2$ gives a deep brown soln., decompd. by EtOH to difluorenylhydrazine, m. 174-5° (yield usually small and variable); CO_2 gives α-fluorene-9-carboxylic acid. PhCH:NN CHPh and Na give ruby-red prisms, $(C_{14}H_{12}N_2Na)_2$; EtOH gives the *compd.* $C_{28}H_{26}N_4$, m. 117-8°; CO_2 gives the *salt*, $C_{30}H_{24}O_4N_4Na_2$. Ph_2C·$NHNH_2$ and Na give a yellow soln., decolorized by EtOH with the formation of $Ph_2CHNHNH_2$, isolated as the *methiodide*, m. 226.5°. $(Ph_2C:NNPh)_2$ gives at first a red soln. with Na, finally changing to blue-violet, the compd. being split at the -N.N- linkage, giving, with EtOH, Ph_2NH and Ph_2CHNH_2, whose HCl salt m. 298° (decompn.). Ph_2C:-NNHPh and Na give a deep violet-blue soln.; with EtOH there results Ph_2CHNH_2, $PhNH_2$ and *benzohydrylidenebenzohydrylamine*, m. 153°, whose structure is established by hydrolysis with dil. HCl. Decompn. of the violet soln. with CO_2 gives *benzohydrylammonium carbonate*, m. 103° (decompn.); heating at 56° gives a *compd.*, $C_{15}H_{17}NO_2$, m. 145°. Ph_2C:NNPhMe gives at first with Na a reddish brown, then a blue-violet color; MeOH gives the amine, m. 153°. MeN·NMe and Na give a pale yellow soln.; EtOH gives MeNHNHMe, m. 163°; CO_2 gives the *Na salt* of $[NMe(CO_2H)]_2$. Ph_2-NN:$NNPh_2$ and Na give as the final products N and Ph_2NH. $Ph_2CNaNNaPh$ with Hg, MeI, BzCl, BzOPh and PhSCN give Ph_2C:NPh. The di-Na deriv. of Ph-CH:NPh, however, gives with PhSCN the *compd.* $C_{40}H_{34}N_4S_2$ $(CHPhNPhCSNHPh)_2$, m. 263°; MeI gives *di-N-methylanilinodiphenylethane*, m. 127°; Ph_2CCl_2 gives Ph_2C:-CPh_2; BzOEt gives the compd. PhCH.NPh.NPh.CHPh, m. 153–4°; BzH gives

the same product; Hg does not react. **V. Triphenylmethyl- and diphenylmethylsodium.** *Ibid* **464**, 1–21(1928).—Ph_3CNa and N_2O in Et_2O give the red *Na triphenylmethyl diazotate*, $Ph_3CN:NONa$, which is sensitive to CO_2 and with EtOH gives Ph_3COH and N_2; with H_2O, N_2 is also evolved but only yellow smeary products are obtained. Continued action of N_2O gives a yellow ppt. of a mixt. of compds. NO and Ph_3CNa give a dark bluish red primary product, which contains about 1.5 NO per 1 Ph_3CNa; if the treatment with NO is continued until the soln. is light yellow and the excess NO removed by N, there results *Na isonitrosotriphenylmethylhydroxylamine*, $Ph_3CN(ONa)NO$ or $Ph_3CN(:O):NONa$, which crysts. with 1 EtOH or 1 C_6H_6, which are lost *in vacuo;* the salt then m. 240–50° (decompn.); the Ag salt is yellowish white, the Hg salt reddish brown, the Cu salt pale violet, the Fe salt egg-yellow and the Pb salt white. With acids the compd. splits off N_2O, giving Ph_3COH. In the presence of a little Na-Hg there results an isomeric *compd.*, which also crysts. with 1EtOH; it also forms salts, which appear identical with the above; however, with acids the isomer gives at first the compd. $Ph_3CN_2O_2H$, which on heating or standing decomps. into Ph_3COH and N_2O. The 2 forms may be *syn-* and *anti*-isomers. Ph_3CCOCl and Ph_3CNa in Et_2O give a dark brownish red *ketyl*, $C_{39}H_{30}ONa$, from which H_2O gives *hexaphenylacetone*, m. 80–1°; with Ph_3CNa, the pure ketone gives the ketyl deriv. Ph_3CNa and EtNCS give the *ethylamide* of *triphenylthioacetic acid*, m. 143°; the *phenyl deriv.* (from PhNCS) m. 157°; the *allyl deriv.* m. 131–2°. Ph_3CNa and PhNCO give $Ph_3CCONHPh$, m. 170°; $ClCO_2Et$ gives Ph_3CCO_2Et, m. 119–20°; AcCl gives Ph_3CH, as do Me_2CHCl and Me_3CCl. $ClCH_2OMe$ and Ph_3CNa give *2,2,2-triphenylethyl Me ether*, m. 137°. Ph_2CHNa and PhNCS give $Ph_2CHCSNHPh$, m. 182°; Ph_2CO gives Ph_2CHCPh_2OH, m. 236°; fluorenone gives *9-benzohydrylfluoren-9-ol*, m. 183°. A method is given for the prepn. of pure Ph_2CHNa. **VI. Alkali addition products from diaryl ketones.** *Ibid* 22–34.—Diphenylindone in Et_2O reacts with Na powder with the formation of a dark reddish brown Et_2O-insol. product; with Et_2O this yields diphenylhydrindone, m. 100°; excess of MeI yields *2,3-diphenyl-2,3-dimethylindan-1-one*, m. 166–7°, while CO_2 gives *2,3-diphenylindan-1-one-3-carboxylic acid*, yellow, m. 181° (decompn.). The deep blue soln. of the di-Na compd. of $PhCOC_6H_4Ph$, shaken with Hg, quickly changes to the bluish green of the ketyl; the mono-Na deriv. and PhNCS give a reddish orange ppt., $C_{14}H_{10}N_2S_2Na_2$, which, with dil. H_2SO_4, gives $(CO_2H)_2$ and the ketone. The di-Na deriv. apparently gives the same compd. The di-Na deriv. of BzPh and $PhCH_2Cl$ give $Ph_2(PhCH_2)COH$, m. 87–8°; the di-Na deriv. of $PhCOC_6H_4Ph$ and $PhCH_2Cl$ give *phenylbiphenylbenzylcarbinol benzyl ether*, $PhC_6H_4(PhCH_2)PhCOCH_2Ph$, m. 164–5°. $PhCH_2MgCl$ and $PhCOC_6H_4Ph$ give *phenylbiphenylbenzylcarbinol*, m. 129–30°; an attempt to prep. the above $PhCH_2$ ether by the action of $PhCH_2Cl$ and HCl upon the alc. gave *1,2-diphenyl-1-biphenylethylene*, m. 134–5°. If instead of $PhCH_2Cl$, MeI is used, there is formed *p-tolyl biphenyl ketone*, m. 133–4°, also obtained from p-MeC_6H_4COCl and Ph_2 with $AlCl_3$ in CS_2; with Na this gives a deep green and then a bluish violet color, decompd. by EtOH to give *p-phenyl-p′-methylbenzohydrol*, m. 110°; that the mother liquor from the above ketone contains $Ph(PhC_6H_4)MeCOH$ is shown by heating the AcOH soln. with a little concd. H_2SO_4, *asym-phenylbiphenylethylene*, m. 94°, being obtained. This was synthesized by the action of MeMgI upon $PhCOC_6H_4Ph$, the primary product being *phenylbiphenylmethylcarbinol*, m. 105–6° (*Me ether*, m. 117°), but if the MeMgI is boiling when the ketone is added, the above ethylene is obtained. Because it was originally thought that the *p*-tolyl ketone was *o-phenylbenzophenone*, m. 90°, this compd. was synthesized. *o-Phenylbenzoyl chloride*, b_{18} 169°, was transformed into the amide, m. 176°, and then into *o-phenylbenzonitrile*, b_{13} 175°, m. 41°, which with PhMgBr gives the ketone. **VII. Various degradation reactions with alkali metals.** *Ibid* 35–42.—$Ph_2C(OMe)_2$, shaken with Na or Li for 3 weeks, gives a red-violet soln.; addn. of EtOH gives a deep green, then an egg-yellow soln., from which ppts. Ph_2MeCOH, m. 79–80°; this indicates the intermediate product $Ph_2MeCONa$. CO_2 likewise ppts. Ph_2MeCOH from the red-violet soln. There is also formed some $Ph_2C(ONa)Na$, since addn. of acid to the CO_2-treated soln. gives a small amt. of $Ph_2C(OH)CO_2H$, m. 150°, and its Me ether, m. 102°. $[Ph_2C(OPh)]_2$ and Na give a reddish yellow soln., from which was isolated Ph_3COH. 9-Phenyl-10-methoxyanthracene and Na give a dark olive-green soln., which, decompd. with EtOH, gives 9,9′,10,10′-tetrahydro-10,10′-diphenyl-9,9′-bianthryl, m. 260°. 9,10-Dimethoxyanthracene and Na give a dark brown soln., from which ppts. a yellowish brown product; 1 Me group reacts with Na giving MeNa and the mono-Na deriv.; with BzCl this gives *anthrahydroquinol Me ether benzoate*, yellowish brown, m. 226–7°, and with I, dimethoxydianthranone, m. 236–8°, and anthraquinone.

C. J. West

N-Methyl derivatives of 2-phenylnaphthylene-1,3-diamine. CHARLES STANLEY GIBSON, WM. SIMPSON KENTISH AND JOHN LIONEL SIMONSEN. Univ. of London. *J. Chem. Soc.* **1928**, 2131–42; cf. Lees and Thorpe, *C. A.* **2**, 125.—2-Phenylnaphthylene-1,3-diamine (I), m. 113.5°; Ac deriv., m. 175°. I (15 g.) in 200 cc. MeOH and 150 g. Me_2SO_4, gradually treated with 600 cc. 25% KOH, give 30% of the α-*N,N'*-di-Me deriv. (II), m. 170°, and 35% of the tetra-Me deriv. (III), m. 122°; by means of the NO deriv. there were also isolated 6% of the tri-Me deriv. and 25% of the β-*N,N'*-di-Me deriv. Further methylation of I gives III quant. II and Ac_2O give a *mono-Ac deriv.*, m. 203°. *p-Toluenesulfonyl deriv.*, m. 219–20°, could not be acetylated or further methylated. *d*-Hydroxymethylenecamphor gives the *compd.* $C_{29}H_{32}ON_2$, m. 167–8°, α_{5461} 406.5°; an Ac deriv. could not be prepd.; the compd. is homogeneous and could not be sepd. into 2 isomers; the salts from *d*-camphor-10-sulfonic acid and *d*-α-bromocamphor-π-sulfonic acid were also homogeneous. I and *p*-$MeC_6H_4SO_2Cl$ in C_5H_5N, heated 4 hrs. on the H_2O bath, give principally the *α-di-p-toluenesulfonyl deriv.* (IV), dimorphic, m. 203–5° and 188–9° (α_1-form); there also results a small amt. of the β-isomer, m. 173–5°, and some *tri-p-toluenesulfonyl deriv.*, m. 153–4°. The *N,N'-di-Me deriv.* of IV, m. 305°, on hydrolysis with AcOH-H_2SO_4 for 2 hrs., gives the pure β-*N,N'*-di-Me deriv. (V) of I, m. 159–60°; Me_2SO_4 converts this into III; *di-Ac deriv.*, m. 207–8°; the *di-d-methylenecamphor deriv.*, m. 277–9°, α_{5461} 650.1°, could not be resolved; other camphor derivs. behaved similarly. II and V give the same dinitrosoamine. The tri-Me deriv. of I, m. 104–5°, yields an *Ac deriv.*, m. 178°. II is considered as the *cis-*, V as the *trans*-form. C. J. WEST

Action of silver on diphenyl-*tert*-butylethinylbromomethane. PAUL L. SALZBERG AND C. S. MARVEL. Univ. of Illinois. *J. Am. Chem. Soc.* **50**, 2840–4(1928); cf. *C. A.* **22**, 2362.—It has been shown that hexa-*tert*-butylethinylethane reacts with liquid Na-K and with liquid Na-Hg to give the corresponding alkali metal derivs. of tri-*tert*-butylethinylmethyl; in a further study of the effect of the C ⋮ C groups on the stability of hexa-substituted ethanes, the closely related tetraphenyldi-*tert*-butylethinylethane was used. The Grignard reagent from $Me_3CC \vdots CH$ and EtMgBr reacts with Ph_2CO to give *diphenyl-tert-butylethinylcarbinol*, $b_{0.4-0.5}$ 132–5°, m. 66.5–7.5°, d_{25}^{25} 1.0124, n_D^{25} 1.5550 (supercooled); *bromide*, m. 58.5–60.5° (cor.). Shaken with Ag in an atm. of air or N, the *hydrocarbon* (I), $C_{38}H_{38}$, m. 153.5–5° (cor.), results; it does not absorb O. In an atm. of O this reaction does not produce a hydrocarbon but O is absorbed very rapidly by the reaction mixt. I reacts with liquid Na-K and with 40% Na-Hg to produce colored alkali metal derivs. but apparently the mol. is not cleaved as would be expected if it has the structure of tetraphenyldi-*tert*-butylethinylethane (II). The suggestion is made that II is formed by the action of Ag on the bromide but that it rapidly dissocs. and rearranges to some more stable structure. If O is present in large amts. the free radicals produced by the dissocn. of II are oxidized before this rearrangement occurs. C. J. WEST

Nature of the alternating effect in carbon chains. XXVIII. The preparation and some properties of benzyl fluoride. CHRISTOPHER K. INGOLD AND EDITH HILDA INGOLD. Univ. of Leeds. *J. Chem. Soc.* **1928**, 2249–62; cf. *C. A.* **22**, 2929.—$PhCH_2Cl$ and Me_3N in EtOH heated at 45° for several hrs., the $PhCH_2NMe_3Cl$ pptd. with Et_2O, the aq. soln. treated with Ag_2O, the filtrate neutralized with 20% HF and evapd. to a viscous sirup and then distd. in vacuum, give 60% of *benzyl fluoride*, b_{14} 40–40.5°, b_{30} 55–6°, b_{64} 70–1°, b_{118} 85–6°, b_{244} 100–100.5°, b_{760} 139.9° (cor.), m. −35°, does not fume in the air and is not lachrymatory; $d_4^{25.3}$ 1.02278, $n^{25.3}$ 1.48481, 1.48919, 1.49294, 1.50014, 1.50927, 1.50967 for λ = 6563, 5893, 5461, 4861, 4358, 4340. Comparative values are given for PhMe. F has by far the lowest refraction values of the halogens and it differs sharply from the others in contributing practically nothing to dispersion. The introduction of a F atom into the aromatic nucleus causes a larger restraint on the electrons and hence a larger increase in the frequency governing dispersion than that produced by the entrance of a F atom into the side chain. Further evidence pointing in a similar direction was obtained by a study of the ultra-violet absorption of $PhCH_2F$, for which curves are given for *M*/100 to *M*/1600 EtOH soln. When the fluoride is touched with a rod moistened with concd. H_2SO_4, a violet reaction sets in and rapidly spreads through the mass, much heat being generated and HF copiously evolved; the product is a white glass, $(C_7H_6)_x$; a similar product is obtained with concd. HF and also when the fluoride decomps. spontaneously in glass vessels; the action seems to be autocatalytic; the kind of glass is an important factor and no losses have occurred when Jena glass has been used for distn. The fluoride (11 g.), boiled for 6 hrs. with 400 cc. 10% K_2CO_3, gives 4.4 g. fluoride, 3.4 g. $PhCH_2OH$ and a mixt. of the 2; Ph-

CH_2Cl gave only $PhCH_2OH$. With boiling EtOH and Zn about 90% of the fluoride is recovered unchanged. With 33% $EtOH-NMe_3$ there is formed only 5% of the quaternary salt. EtONa gives a mixt. of unchanged fluoride and Et ether. Nitration in Ac_2O yields the following proportions of mono-NO_2 derivs.: *o*-28.1, *m*-17.5, *p*-54.4%; *p-NO_2 deriv.*, m. 38.5°. Distn. of *o*-, *m*-, or *p*-$O_2NC_6H_4NMe_3F$ gave the corresponding $O_2NC_6H_4CHO$. **XXIX. Further experiments bearing on the problem of the ortho-para ratio in aromatic substitution.** C. K. Ingold and Charles C. N. Vass. *Ibid* 2262-7.—In the nitration of *p*-FC_6H_4Cl the addn. of H_2SO_4 increases the proportion of 1,2,4-compd. relatively to its isomer (1,3,4-deriv.) by 31% and the addn. of fuming H_2SO_4 caused an increase of 64%. The m. p. curve of 2,5-$FClC_6H_3NO_2$ and 5,2-$FClC_6H_3NO_2$ is given. Their behavior with MeOH-MeONa is also reported.

C. J. West

Hydrogenation of nitrobenzene with platinum black. G. Vavon and Krajčinović. *Compt. rend.* **187**, 420-2(1928).—Equal wts. of $PhNO_2$ (I), and BzH are hydrogenated in alc. or AcOH with Pt black. After 1.8 moles of H_2 are added the reaction is stopped and 40% PhN(:O):CHPh (II), m. 112°, is obtained (indicating that in the reduction of I with Pt black it passes to PhNHOH). **II** is easily reduced to $PhN(OH)CH_2Ph$, m. 86°. Similar results are obtained using piperonal in place of BzH. Nitrotoluenes similarly treated did not give any condensation products.

D. H. Powers

Nitration of chlorobenzene. O. Yu. Nagidson and I. Kalishevskii. *Trans. sci. chem.-pharm. inst.* (Moscow) **6**, 17-20(1923).—PhCl and nitrating acid afford chiefly *p*-$ClC_6H_4NO_2$, while $NaNO_3$ and H_2SO_4 afford chiefly the *o*-compd. The latter reagent readily gives 2,4-$(O_2N)_2C_6H_3Cl$ at a higher temp.

B. C. A.

Reduction of aromatic nitro compounds with sodium alcoholates. C. M. Suter and F. B. Dains. Univ. of Kansas. *J. Am. Chem. Soc.* **50**, 2733-9(1928).—With the exception of *o*-halonitro derivs., Na and PrOH, BuOH and iso-AmOH gave a yield of from 50-90% reduction products, consisting of amine and azoxybenzenes; the *o*-halonitrobenzenes condense with the CH_2 grouping of the alcs. with the formation of NH_2 acids. $PhCH_2OH$ reduced the NO_2 compd. to azoxybenzene and was fully oxidized to BzH and BzOH. The aliphatic alcs. were oxidized to acids of less C content, among them HCO_2H. A table is given showing the results of 34 expts. with various halonitro compds. and alcs. *o*-$ClC_6H_4NO_2$ and PrONa in C_6H_6 give 40% *o*-$ClC_6H_4NH_2$ and *α-o-chloroanilinopropionic acid*, m. 150°, also prepd. from *o*-$ClC_6H_4NH_2$ and $MeCHBrCO_2H$; soly. in H_2O: 30°, 0.094 g. per 100 cc.; at b. p., 0.44 g.; $CuSO_4$ gives a green color; heating above 165° causes the loss of CO_2. *N-Ethyl-o-chloroaniline*, b_{726} 219° (cor.), d_4^{25} 1.104, d_4^{35} 1.0911; *HCl salt*, m. 138-9°. *α-Ethyl-α-o-chlorophenyl-β-phenylurea*, m. 144°. *α-o-Chloroanilinobutyric acid*, m. 95°; *isovaleric acid*, m. 75°. *α-o-Bromoanilinopropionic acid*, m. 162-4°; *butyric acid*, m. 83°. *α-2,5-Dichloroanilinopropionic acid*, m. 163°. *α-o-Chloroanilinophenylacetic acid*, yellow, m. 160°. Results of 19 expts. with *o*-halonitrobenzenes are given, showing the yield of amine, azoxy compd. and amino acid.

C. J. West

Formation of bases from carbonyl compounds. A. Skita and F. Keil. Techn. Hochschule, Hanover. *Ber.* **61B**, 1452-9(1928).—Reduction of Schiff bases to secondary amines gives different yields, depending on the nature of the base. Thus, while PhCH:NPh is reduced almost quant. to $PhCH_2NHPh$ by the ordinary reducing agents, the yields decrease very rapidly with increasing mol. wt. of the radicals attached to the N and with Schiff bases contg. unsatd. residues, as these unstable substances often easily escape reduction as the result of polymerization or hydrolysis. For this reason recourse had already been had in some cases (*e. g.*, in the prepn. of $Ph(CH_2)_3NHEt$ from PhCH:CHCH:NEt; cf. *C. A.* **21**, 2882) to catalytic reduction with colloidal Pt in acid soln. But this method also gives no appreciable quantities of basic reduction products with more unstable imino compds. (*e. g.*, *citralmethylamine* (I)); evidently the hydrolytic action of the acids is more rapid than the hydrogenation velocity. Whereas a Schiff base in neutral soln. or suspension takes up either no H or only an insufficient quantity, addn. of NH_3 to the colloidal Pt results in a vigorous absorption of H and the formation of the corresponding secondary base. Amines exert a similar catalytic influence. In fact, in many cases it is better not to start with the preformed Schiff bases but with a mixt. of their components (aldehyde and amine). Thus, citral and a slight excess of $MeNH_2$ yielded considerably more *N*-methyl-3,7-dimethyloctylamine (II) than did I. Under the proper conditions citral in NH_4OH suspension gives no primary amine but only the secondary *bis*[*3,7-dimethyloctyl*]*amine* (III). While other aldehydes of high mol. wt. yield secondary amines in the same way (*e. g.*, diheptylamine (IV) from enanthaldehyde), the initial members of the aldehyde series (AcH,

EtCHO) yield the tertiary amines. Ketones with NH_3 or primary amines in aq. suspension also yield secondary bases. *Citralcyclohexylamine*, b_{18} 170–2°, gives in alc. with colloidal Pt and AcOH *N-cyclohexyl-3,7-dimethyloctylamine*, b_{14} 151–3°; *HCl salt*, m. 154–5°; *picrolonate*, m. 174–5°. *Citralisoamylamine*, b_{20} 150–4°, in neutral alc. soln. yields *N-isoamyl-3,7-dimethyloctylamine*, b_{17} 142–5°; *HCl salt*, m. 168–9°; *picrolonate*, m. 186–7°. *Citralethylamine*, very unstable, b_{12} 113–5°, in neutral soln. yields at most 2% of *N-ethyl-3,7-dimethyloctylamine* (V) but 9 g. of the base in 50 cc. alc. with 3 cc. of 25% NH_3 and 100 cc. of 1% Pt (contg. 1 g. gelatin) absorbs the calcd. quantity of H in 1.5 hrs. at room temp. under 3 atm. excess pressure and yields 5 g. V, b_{13} 135–7°; *HCl salt*, m. 102–3°; *NO deriv.*, oil; *picrolonate*, m. 196–7°. I, b_{13} 107–9° (in H). III, from 16.2 g. citral and colloidal Pt (prepd. from 30 cc. H_2PtCl_6, 20 cc. 1% colloidal Pt and 20 cc. 10% gum arabic) suspended in 40 cc. H_2O, treated with 7.5 cc. 24% aq. NH_3 and hydrogenated at room temp. under 3 atm. excess pressure, b_{15} 191–3°; *HCl salt*, m. 141–2°. IV, m. 30°, b. 270–2°; HCl salt, m. 250°, is *not* hygroscopic. $(iso\text{-}Pr)_2NH$, from Me_2CO in aq. NH_4OH, b. 84°; HCl salt (5 g. from 15 g. Me_2CO), m. 212–4°; *picrate*, m. 140°. MeCOEt gives $(MeEtCH)_2NH$, b. 230–3°, whose HCl salt is not deliquescent but, when pure, is stable in the air and m. 215–6°. Et_2CO gives $(Et_2CH)_2NH$. From cyclohexanone is obtained *dicyclohexylamine*, b_{20} 128–30°; *HCl salt*, m. around 340°. MeCOEt and aq. $EtNH_2$ give EtNHCHMeEt, b. 96–8°. *N-Ethylcyclohexylamine*, from cyclohexanone and $EtNH_2$, b. 161°.

C. A. R.

Attempted synthesis of β-m-aminophenylethylamine. A. K. De. *J. Indian Chem. Soc.* **5**, 29–31(1928).—*m*-Aminocinnamic acid, m. 180°, prepd. from *m*-nitrocinnamic acid, m. 200 1° (colorless), yields *m-acetamidocinnamic acid*, m. 235°, which in turn gives *β-m-acetamidophenylpropionic acid*, m. 162°, on reduction with Na-Hg. The failure of the prepn. of the amide of the last-named precluded the synthesis of $m\text{-}H_2NC_6H_4CH_2CH_2NH_2$ by this method. It was also not found possible to reduce *m,ω-dinitrostyrene*, m. 123–4°, prepd. from $m\text{-}O_2NC_6H_4CHO$ and $MeNO_2$, to the amine.

B. C. A.

Preparation of furanethylamine. Teijiro Yabuta and Katsuji Kambe. Tokyo Imp. Univ. *Proc. Imp. Acad.* (Japan) **4**, 120–1(1928).—Furylethylamine is conveniently prepd. by reducing β-nitro-2-furylethylene (action of NO fumes on β-2-furylacrylic acid in C_6H_6) with Al-Hg to 2-furylacetaldoxime and the latter with Na-Hg.

C. J. West

Synthesis of *dl*-2,5-dihydroxyphenylalanine. Kinsaburo Hirai. Akad. Nagasaki. *Biochem. Z.* **189**, 88–91(1927).—Gentisaldehyde, 7 g., prepd. from $o\text{-}HOC_6H_4\text{-}CHO$, was methylated in 10% NaOH soln. with Me_2SO_4. The product was condensed with glycine anhydride. The resulting 2,5-dimethoxybenzalglycine anhydride was refluxed 8 hrs. with red P and HI, the soln. dild , filtered and pptd. with $Pb(OAc)_2$, the PbI_2 filtered off, the soln. made alk. with NH_4OH and treated with H_2S, filtered and evapd. nearly to dryness in a current of CO_2. dried *in vacuo*, dissolved in H_2SO_4 and crystd. in the ice chamber. Yield 0.5 g., m. 203–4°. E. H.

5-Bromo-1,3-dimethyl-4-aminobenzene and some of its derivatives. E. Bureš and A. Mandel-Borgmannová. Charles Univ., Prague. *Časopis Československého Lékárnictva* **7**, 257–69(1927).—By the action of Br on $2,4\text{-}Me_2C_6H_3NH_2$ at ordinary temp. and pressure, without catalysts, and protected from sunlight, is formed 5-bromo-1,3-dimethyl-4-aminobenzene (I), m. 49–50° (H_2SO_4 salt, m. 183°; picrate, m. 122°; Bz deriv., m. 183°; Ac deriv., m. 197–8°). I was converted to 5-bromo-1,3-dimethylbenzene, b. 204°, which on oxidation gave 5-bromo-3-methylbenzoic acid, m. 178°. I was converted to 5-bromo-1,3-dimethyl-4-hydroxybenzene, b. 231° (Me ether, b. 140°; Et ether, b. 142°; Ac deriv., b. 257–8°). I was converted by Gattermann's reaction into 4,5-dibromo-1,3-dimethylbenzene, b. 257°. I was converted to 5-bromo-1,3-dimethyl-4-benzonitrile, m. 218°, which on hydrolysis gave 6-bromo-2,4-dimethylbenzoic acid, m. 186° (Me ester, m. 174°; Et ester, m. 176°; Pr ester, m. 178°; iso-Bu ester, m. 182°; Am ester, m. 181°). William J. Husa

2,5,6-Trichloro-1,3-dimethyl-4-aminobenzene and some of its derivatives. E. Bureš and J. Borgmann. Charles Univ., Prague. *Časopis Československého Lékárnictva* **7**, 270–80(1927).—By the action of Cl on $2,4\text{-}Me_2C_6H_3NHAc$, m. 123°, dissolved in glacial AcOH, at ordinary temp. and pressure, without catalysts, is formed 2,5,6-trichloro-1,3-dimethyl-4-acetamidobenzene, m. 208.5° (I). The introduction of the 3 Cl atoms stabilizes the mol. and lowers the basicity of the amine. I on sapon. yields 2,5,6-trichloro-1,3-dimethyl-4-aminobenzene, m. 204° (II) (Bz deriv., m. 174–5°; HCl salt, m. 217°). II was converted to 2,5,6-trichloro-1,3-dimethyl-4-hydroxybenzene, m. 174° (Me ether, m. 91.5°; Et ether, m. 53.5°; Ac ester, m. 86°). Other

derivs. of II prepd. were 2,5,6-trichloro-1,3-dimethylbenzene, m. 179.5°; 2,5,6-trichloro-1,3-dimethyl-4-benzonitrile, m. 218°, which on hydrolysis gave 3,5,6-trichloro-2,4-dimethylbenzoic acid, m. 191.5°; and 2,4,5,6-tetrachloro-1,3-dimethylbenzene, m. 219°. WILLIAM J. HUSA

Solubility of diphenylamine in water, in alcohol and in other organic solvents. LOUIS DESVERGNES. *Ann. chim. anal. chim. appl.* **10**, 253–5(1928).—The d. at 15°, color of the soln. and amt. dissolved by 100 g. of solvent at 0°, 28° and 40° are given for 12 solvents. The following are, resp., the d. at 15° and amt. dissolved at 28°: AcOEt, 0.9048, 306.8; AcMe, 0.7998, 298.6; EtOH, 0.7944, 95.84; MeOH, 0.8055, 123.0; C_6H_6, 0.8826, 278.0; $CHCl_3$, 1.489, 206.3; Et_2O, 0.7193, 324.8; pyridine, 0.9805, 306.9; CS_2, 1.272, 314.1; CCl_4, 1.601, 1.22.6; toluene, 0.8733, 227.7; *m*-xylene, 0.8683, 163.4. Ph_2NH is very slightly sol. in hot water, but readily sol. in most org. solvents. The solvent should not contain any free Cl_2 and an alc. soln. should not be exposed to light. W. T. H.

Comparative mechanism of deamination of some aromatic amines and dehydration of the corresponding alcohols. JEANNE LÉVY, PAUL GALLAIS AND DINAH ABRAGAM. Paris Univ. *Bull. soc. chim.* **43**, 868–81(1928).—Deamination with HNO_2 gave *1,1-diphenyl-2-propene*, b. 293°, n^{20} 1.596, from *1,1-diphenyl-2-propylamine*, m. 62–3°; *HCl deriv.* m. 280–2°; *Ac deriv.* m. 107–8°; *Bz deriv.* m. 203–4°. The same treatment gave *2-phenyl-1-anisyl-1-propene*, m. 86–7°, from *1-phenyl-1-anisyl-2-propylamine*, m. 63–4°; *HCl deriv.* m. 215–6°; *Bz deriv.* m. 181–2°. Distn. of *1,1-diphenyl-2-propanol*, m. 62° (*Ac deriv.* m. 77–8°), in the presence of pumice satd. with H_2SO_4 gave *methylstilbene* and $Ph_2CHCH{:}CH_2$. Under these conditions *1-phenyl-2-anisyl-1-propene*, m. 103–4°, was formed from *1-phenyl-1-anisyl-2-propanol*. From these results it is shown that rearrangement may or may not take place during deamination and that the nature of the groups dets. the mechanism of deamination and dehydration. Since the products are not the same in the 2 cases, NH_2 removal does not take place through the alc. when $Ph_2CRCHRN_2OH$ decomps. to form an ethylenic compd. The authors are led to believe that in those cases where the alc. can be isolated, it is present in consequence of a secondary reaction. The following compds. are reported in the course of the work: *1-anisyl-1-phenyl-1-propanol*, b_{13-4} 20°, n^{20} 1.583; the *2,1,1-compd.* b_{18} 210–5°; *1,1-diphenyl-2-propenoxide*, b_{16} 182–5°, b_{760} 300°, n^{20} 1.5745; *1-phenyl-1-anisyl-1-propane*, m. 53°; *1-phenyl-1-anisyl-2-propanone*, b_{25} 225°, d_{20} 1.159; *1-phenyl-1-anisyl ethane*, m. 75–6°. These alcs. were prepd. by the Grignard reaction and the amines by reduction of oximes in EtOH with Na. A. S. CARTER

Some molecular rearrangements in the course of the deamination of some aromatic amines. JEANNE LÉVY AND PAUL GALLAIS. Paris Univ. *Bull. soc. chim.* **43**, 862–8 (1928).—By slowly adding 3.5 g. of $NaNO_2$ (in soln.) to 11 g. of *2,2-diphenylethylamine-HCl* in 15 cc. of HOAc and 100 cc. of H_2O and heating for 1 hr. on the H_2O bath a brown oil was obtained which gave 7 g. of *stilbene* after Et_2O extn. and crystn. from EtOH. Reducing 20 g. of $Ph_2CMeCH{:}NOH$ with Na in EtOH gave 15 g. of *2,2-diphenyl-1-propylamine*, b_{22} 179–82°, d_{18} 1.027; *HCl deriv.* (I), m. 261–3°; *Bz deriv.* m. 82–3°; *Ac deriv.* m. 106–7°. I treated with $NaNO_2$ in HOAc forms *methylstilbene*, m. 82–3°, after distn. and crystn. from MeOH. Reduction of 20 g. of $Ph_2CEtCH{:}NOH$ by 30 g. of Na in 250 cc. of EtOH gave 12 g. of *2,2-diphenyl-1-butylamine*, b_{24} 125°, d_{20} 1.20; *HCl deriv.* (II) m. 252°; *Ac deriv.* m. 114°; *Bz deriv.*, m. 144–5°. When treated with $NaNO_2$, II gave *ethylstilbene*, b. 300–5°, which was identified by oxidation to PhAc. Failure to isolate intermediate alcs. in these reactions leads L. and G. to believe that $Ph_2CRCH_2N{\cdot}NOH$ forms $Ph_2CRCH<$ with simultaneous rearrangement to $PhCR{\cdot}CHPh$ and no intermediate Ph_2CRCH_2OH. A. S. CARTER

Some abnormal reactions of organomagnesium halides. HENRY GILMAN, J. E. KIRBY, R. E. FOTHERGILL AND S. A. HARRIS. Ia. State Col., Ames. *Proc. Iowa Acad. Sci.* **34**, 221–2(1927).—Nitro and nitroso groups react with methylmagnesium halides (and other RMgX compds.) to give CH_4 and some C_2H_6. The gases so evolved make it necessary to correct for the ordinary detn. of active H_2 by means of the Zerevitinov method. Accordingly the new hydroxy structure proposed for *o*-nitrobenzaldehyde finds no support on the basis of gas evolved when treated with alkylmagnesium halides. Benzylmagnesium halides, and related RMgX compds. like α-$C_{10}H_7CH_2MgCl$ (where the —MgX group is attached to a C that is attached in turn to an unsatd. C) have been found to give rearrangement products with new compds. like $ClCO_2Et$ and ethylene oxide. In some cases (with $PhCH_2MgCl$) rearrangement takes place to the *p*-position. A study is in progress of the mechanism of such rearrangements. In connection with the proof of the non-addn. of RMgX compds. to an ethylenic linkage, it has been shown that $PhCH{:}CHCOCl$ when treated with Mg gives largely a Grignard reagent which

when treated with CO_2 gives methylatropic acid. The 3 other cases in the literature that have been offered as apparent proofs for the addn. of RMgX compds. to an ethylenic linkage are also being investigated. W. G. GAESSLER

Action of diazo salts on aromatic sulfonamides. II. The mechanism of the reaction and the constitution of the diazosulfonamides. ARTHUR KEY AND PAVITRA KUMAR DUTT. Univ. of Leeds. *J. Chem. Soc.* **1928**, 2035–40; cf. *C. A.* **16**, 915.—The object was to elucidate the mechanism of the reaction $RSO_2NH_2 + R'N_2X \longrightarrow RSO_2NHN{:}NR' \longrightarrow RSO_2H + R'N_3$. The reaction may be a case of true migration of the H atom from the N to the O, followed by fission into the 2 final products; this was tested by heating p-$MeC_6H_4SO_2NHN{:}NPh$ both by itself and in C_5H_5N at a temp. above its decompn. point. In the former case a minute quantity of the azoimide was obtained but none was formed in the latter expt. The reaction is plausibly explained by the action of HO ions on the H which is incipiently ionized because of the strong electron attraction exercised by some neighboring center; this may be formulated as follows:

$$\overset{+\text{O}^-}{\underset{+\text{O}^-}{\text{R.S}}}\text{.HN.N:NR}' \longrightarrow \text{RSO}_2\overset{-}{\text{N}}\text{.N:NR}' + \overset{+}{\text{H}}.$$

AcOH gives PhOH and p-$MeC_6H_4SO_2NH_2$. The *Me deriv.*, p-$MeC_6H_4SO_2N\cdot NNMePh$, m. 124–5° (decompn.); reduction with Na-Hg gives NH_3, p-$MeC_6H_4SO_2NH_2$, PhNHMe, $PhNMeNH_2$ and $(PhMeNN{:})_2$. The isomeric Me deriv. from p-$MeC_6H_4SO_2NHMe$ and PhN_2Cl forms a gum which could not be crystd. Reduction gives $PhNH_2$ and $PhNHNH_2$, thus indicating that it is not identical with the 1st deriv. The electronic interpretation is also applied to these reactions. C. J. WEST

Preparation of guaiacolsulfonic acid from p-dichlorobenzene. JOSEF S. TURSKI, A. PIOTROWSKI AND S. WINAWER. *Przemysl Chem.* **11**, 365–70(1927).—This prepn. was accomplished as follows, with corresponding yields: p-dichlorobenzene $\longrightarrow$ 2,5-dichloronitrobenzene, m. 53° (98%) $\longrightarrow$ p-chloro-o-nitroanisole, m. 97° (85%) $\longrightarrow$ m-chloro-o-anisidine, m. 80° (92%) $\longrightarrow$ *chloroguaiacol*, m. 37° (66%) $\longrightarrow$ *guaiacolsulfonic acid* (88%). This does not m. 270°, and chars at a higher temp. With $FeCl_3$ it gives a bluish green color which turns yellow on careful addn. of NH_4OH. $BaCl_2$ in presence of NH_4 gives no ppt. as does the p-compd. HNO_3 in aq. solns. gives a brick-red color without pptn. Its aq. soln. reduces $AgNO_3$. In general its properties are identical with those of *Heyden's acid* (*Chem. Zentr.* **1907**, II, 1467; D. R. P. 188,506). Chloroguaiacol and o- (not the p-) guaiacolsulfonic acid possess important medicinal properties. A. C. ZACHLIN

Halogen derivatives of o- and p-azophenol. LOUIS HUNTER AND RONALD S. BARNES. Univ. Coll. of North Wales. *J. Chem. Soc.* **1928**, 2051–8.—The following derivs. of *4,4'-dihydroxyazobenzene* were prepd. by the use of the chloramine method; the brominating agent was a mixt. of KBr and dichloramine-T in AcOH: *3-Cl*, red, m. 184° (*di-Ac deriv.*, orange, m. 160–1°; *di-Bz deriv.*, yellow, m. 158–9°); *3,3'-di-Cl*, rust-red, m. 195° (*di-Ac deriv.*, orange, m. 199°; *di-Bz deriv.*, bright yellow, m. 226°); *3,5,3'-tri-Cl*, yellow-brown, m. 172° (*di-Ac deriv.*, orange, m. 207–8°; *di-Bz deriv.*, yellow, m. 189°); *3,5,3',5'-tetra-Cl*, crystg. with 6 H_2O, yellow, m. 225°, or, anhyd., 240° (*di-Ac deriv.*, yellow, m. 240°; *di-Bz deriv.*, orange, m. 244°); *3-Br*, yellow, m. 153°, rapidly darkens in the light (*di-Ac* deriv., orange, m. 142°; *di-Bz deriv.*, yellow, m. 165–6°); *3,3-di-Br*, light brown, m. 175° (*di-Ac deriv.*, yellow-orange, m. 161°; *di-Bz deriv.*, pale yellow, m. 227°); *3,5,3'-tri-Br*, brown, m., 184° (*di-Ac deriv.*, light brown, m. 172°; *di-Bz deriv.*, yellow, m. 216°); the 3,5,3',5'-tetra-Br deriv. yields a yellow *di-Ac deriv.*, m. 240°, and an orange *di-Bz deriv.*, m. 265°; *3,3'-dichloro-5,5'-dibromo*, yellowish red, m. 262°. The action of ICl on p-azophenol gives quinhydrone-azine. *2,2'-Dihydroxyazobenzene derivs.: 5-Cl*, brown, m. 164° (*di-Ac deriv.*, orange, m. 117°; *di-Bz deriv.*, brown, m. 119°); *5,5'-di-Cl*, orange-yellow, m. 267° (*di-Ac deriv.*, orange-red, m. 199°; *di-Bz deriv.*, pale brown, m. 243°); reduction and acetylation give *4-chloro-2-acetamidophenyl acetate*, m. 170°; the 3,5,5'-tri-Cl deriv., m. 235°, gives a *di-Ac deriv.*, pale orange, m. 189°, and a *di-Bz deriv.*, yellow-brown, m. 247°; *3,5,3',5'-tetra-Cl deriv.*, orange-red, m. 246–7° (*di-Ac deriv.*, pink, m. 195°; *di-Bz deriv.*, yellowish brown, m. 186°); reduction gives *2,4-dichloro-6-aminophenol*, m. 109° (decompn.), isolated as the *HCl salt*; *5-Br*, brown, m. 154° (*di-Ac deriv.*, dark orange, m. 142°; *di-Bz deriv.*, light brown, m. 215°); *5,5'-di-Br*, orange-red, m. 249° (*di-Ac deriv.*, orange, m. 211°; *di-Bz deriv.*, pale brown, m. 202°); 3,5,3',5'-tetra-Br, m. 262° (*di-Ac deriv.*, brown, m. 210–1°; *di-Bz deriv.*, orange, m. 214°); *5-I deriv.*, brown, m. 149–50° (*di-Ac deriv.*, brown, m. 138°; *di-Bz deriv.*, pale brown, m. 159°); *5,5'-di-I*, brown, m. 153° (*di-Ac deriv.*, dark brown, m. 145°; *di-Bz deriv.*, pale brown, m. 147°); reduction gives *p-iodo-o-aminophenol*, m. 139° (*HCl salt*); *3,5,3',5'-tetra-I*, brown, m. 98–9° (di-Bz

deriv., gray-brown, m. 241°); reduction gives *2,4-diiodo-6-aminophenol*, m. 120° (*HCl salt*). C. J. West

Preparation of some halogenoaminophenols. I. Mixed tetrahalogen derivatives of *o*-azophenol. II. Halogen derivatives of *p*-hydroxyazobenzene. Louis Hunter and Ronald Sidney Barnes. Univ. Coll. of North Wales. *J. Chem. Soc.* **1928**, 2058-67.—*5,5'-Dichloro-3,3'-dibromo-2,2'-dihydroxyazobenzene* (I) prepd. by chlorination and then bromination of *o*-azophenol, orange-red, m. 259° (decompn.); *di-Ac deriv.*, pale orange, m. 203°; *di-Bz deriv.*, orange, m. 212°; *3,3'-dichloro-5,5'-dibromo deriv.* (II), orange-red, m. 263°; *di-Ac deriv.*, orange, m. 199°; *di-Bz deriv.*, orange, m. 201°; *5,5'-dichloro-3,3'-diiodo deriv.* (III), orange-yellow, m. 272° (decompn.); *di-Ac deriv.*, orange, m. 205°; *di-Bz deriv.*, light brown, m. 254°; *5,5'-dibromo-3,3'-diiodo deriv.* (IV), light brown, m. 255° (decompn.) (83% yield); *di-Ac deriv.*, pale orange, m. 186°; *di-Bz deriv.*, pale brown, m. 252°; *3,3'-dibromo-5,5'-diiodo deriv.* (V), orange-red, m. 256°; *di-Ac deriv.*, golden, m. 217°; *di-Bz deriv.*, orange-red, m. 215°; the 3,3'-dichloro-5,5'-diiodo deriv. was obtained only as a dark brown amorphous powder. Reduction of I with $SnCl_2$ and HCl yields *4-chloro-6-bromo-2-aminophenol*, m. 89-90°; HCl salt; the *acetate* of the *2-Ac deriv.* m. 130°; the *benzoate* of the *2-Bz deriv.* m. 180.5°. Reduction of II gives *6-chloro-4-bromo-2-aminophenol*, m. 93°; *HCl salt;* the *acetate* of the *2-Ac deriv.* m. 137°; the *benzoate* of the *2-Bz deriv.* m. 182°. III gives *4-chloro-6-iodo-2-aminophenol*, charring about 90°; *HCl salt;* the *acetate* of the *2-Ac deriv.* m 169°. IV gives *4-bromo-6-iodo-2-aminophenol*, decomps. before melting; *HCl salt;* the *acetate* of the *2-Ac deriv.* m. 190°; the *benzoate* of the *2-Bz deriv.* m. 185°. V gives *6-bromo-4-iodo-2-aminophenol*, m. 90°; *HCl salt; acetate* of *2-Ac deriv.*, m. 196°; *benzoate* of the *2-Bz deriv.*, m. 194-5°. Since iodo-*p*-azophenols could not be prepd., I-substituted p-$H_2NC_6H_4OH$ were obtained by reducing the I derivs. of p-$HOC_6H_4N_2Ph$, which are readily accessible. o-BrC_6H_4OH and PhN_2X in strongly alk. soln. give 90% of *3-bromo-4-hydroxyazobenzene*, yellow, m. 80° (*HCl salt*, purple-brown, m. 159°; *Ac deriv.*, yellow-brown, m. 98°; *Bz deriv.*, brown, m. 113°). *3-I deriv.*, yellow, m. 77 8° (85% yield) (*HCl salt*, blue-black, m. 172° (decompn.); *Ac deriv.*, orange, m. 103-4°; *Bz deriv.*, pale orange, m. 105°). 3,4-$Cl(HO)C_6H_3N_2Ph$ on bromination with acetochloramide and KBr or 5,4-$Br(HO)C_6H_3N_2Ph$ on chlorination with dichloramine-T gives *3-chloro-5-bromo-4-hydroxyazobenzene*, orange, m. 125.5° (*Ac deriv.*, orange-brown, m. 133.5°; *Bz deriv.*, orange, m. 118.5°); reduction and acetylation give *2-chloro-6-bromo-4-acetamidophenyl acetate*, m. 168.5°; *benzoate* of the *4-Bz deriv.*, m. 111 2°. *3-Chloro-5-iodo-4-hydroxyazobenzene*, brown, m. 110°, *Ac deriv.*, orange-red, m. 124°, *Bz deriv.*, orange, m. 115°. Reduction gives *2-chloro 6-iodo-4-aminophenol*, m. 169° (decompn.); *HCl salt; acetate* of the *4-Ac deriv.*, m. 155°; *benzoate* of the *4-Bz deriv.*, m. 157°. *3-Bromo-5-iodo-4-hydroxyazobenzene*, orange-brown, m. 128.5°; *Ac deriv.*, orange, m. 127-8°; *Bz deriv.*, brown, m. 85°; reduction gives *2-bromo-6-iodo-4-aminophenol*, m. 185°; *HCl salt; acetate* of the *4-Ac deriv.*, m. 186°; *benzoate* of the *4-Bz deriv.*, m. 148°. 3,4-$I(HO)C_6H_3N_2Ph$ and ICl give the *3,5-diiodo deriv.*, brown, m. 128-9°, *Ac deriv.*, orange-brown, m. 162°; *Bz deriv.*, yellow, m. 137-9°; reduction and acetylation gives *3,5-diiodo-4-acetamidophenyl acetate*, m. 209°. C. J. West

Urea derivatives. St. Weil and T. Zyngier(owna). *Roczniki Chem.* **8**, 177-82 (1928); cf. *C. A.* **22**, 4202.—The following compds. were obtained by heating urea with the corresponding amine to 130 2°: *o-carbethoxyphenylurea*, begins to turn gray 336-7°, m. 342-3° (decompn.), sol. in org. solvents, insol. in water. *Pentamethyleneurea* of the same m. p. as Cahour's compd. (*Ann. chim.* [3] **38**, 84.) *Dicarbamidopiperazine* $C_4H_8N_2(CONH_2)_2$, m. 290°, sol. in alc. and water. *Antipyrylurea*, m. 245°, identical with Knorr's compd. (*Ann.* **293**, 65). *p-Carbethoxyphenylantipyrylurea*, from p-$NH_2C_6H_4CO_2Et$ and antipyrylurea or from aminoantipyrine and $NH_2CONHC_6H_4CO_2Et$ at 180°. Mary Jacobsen

The position occupied by the acetomercuric groups in anilines having in the nucleus a halogen group or a hydrocarbon residue. III. L. Vecchiotti. R. Univ. Bologna. *Gazz. chim. ital.* **58**, 231-9(1928); cf. *C. A.* **22**, 2555.—A new method of prepn. of p-$BrC_6H_4NH_2$ (I) is described. Br (5 g.) added dropwise to PhNHAc (27 g.) in 50% AcOH (160 cc.) cooled, dild. with water, filtered, the residue (p-BrC_6H_4NHAc) washed, dried, crystd. from EtOH, refluxed 3 hrs. with HCl (calcd. quantity) in abs. EtOH, cooled, the ppt. treated in water with excess 50% KOH and the ppt. crystd. from EtOH yields pure I. EtOH (200 cc. contg. a few cc. of AcOH) added to $Hg(OAc)_2$ in water (100 cc.), p-$BrC_6H_4NH_2$ (18 g.) in EtOH (100 cc.) added, let stand 48 hrs. with frequent agitation, the ppt. dissolved in NH_4OH contg. NH_4OAc, filtered, and repptd. by neutralizing with dil. AcOH, yields *2-acetatomercuri-p-bromoaniline* (II), m. 194°. An intimate mixt. of II (5 g.) and 50% KOH (25 cc.) let stand 24 hrs., dild. with water,

filtered, and the ppt. recrystd. from EtOH, yields *2-hydroxymercurio-p-bromoaniline*, m. 180°. Boiling satd. alc. KBr (1.19 g.) added to **II** (4.30 g.) in a min. of boiling EtOH ppts. on cooling *2-bromomercuri-p-bromoaniline* decomps. without fusion at 194°. Satd. alc. $Na_2S_2O_3$ (calcd. quantity) added to **II** (5 g.) in a min. of EtOH slowly ppts. *o,o'-mercuri-bis-p-bromoaniline*, decomps. 220°. **II** (6 g.) let stand 6 days with excess Ac_2O and the ppt. recrystd. from EtOH yields the *Ac deriv.* (**III**) of **II**, $C_{10}H_{10}O_3$-NBrHg. Br (3 g.) in glacial AcOH added with agitation to **III** (6 g.) in glacial AcOH, water added until pptn. is complete, and the ppt. recrystd. repeatedly from EtOH yields 2,4-dibromoacetanilide, m. 146° (cf. *Ber.* **7**, 348), which establishes the constitution of **II**. A survey of all Hg derivs. of $PhNH_2$ in which the H of the nucleus in *p*-position is replaced by a hydrocarbon residue or by a halogen or by HgOAc group shows in conformity to the rule of Pesci (*Gazz. chim. ital.* **48**, ii, 78 (1918); **51**, ii, 208 (1921)) that when an aromatic substance in which the *p*-position is already occupied is mercurated, the HgOAc group always enters the *o*-position. Anilines which have their *p*-nuclear H replaced by a hydrocarbon residue or by a halogen form in most cases only a single monomercurated deriv. (p-$O_2NC_6H_4NH_2$ is an exception). In anilines in which the *p*-nuclear H is replaced by a hydrocarbon residue or by a halogen group, the HgOAc group always enters, as in all similar cases in aromatic compds., the *o*-position with respect to the NH_2 group. When 2 HgOAc groups enter $PhNH_2$, one enters the *p*- and the other the *o*-position with respect to the NH_2 group C. C. D.

Action of mercuric acetate on *o*-bromoaniline. L. VECCHIOTTI. Univ. di Bologna. *Gazz chim. ital.* **58**, 239–44 (1928).—The expts complete work on the action of $Hg(OAc)_2$ on anilines with a halogen in *o*-position to NH_2 (cf. V. and Michetti, *C. A.* **21**, 395). $Hg(OAc)_2$ (32 g.) in water (100 cc) and EtOH (200 cc.) acidified slightly with AcOH, o-$BrC_6H_4NH_2$ (17 g) added, let stand 48 hrs., filtered, the ppt. washed, suspended in water, dissolved in NH_4OH contg. NH_4OAc, filtered, the filtrate neutralized with AcOH and the ppt again purified 3 times in the same way, yields *4-acetatomercuri-2-bromoaniline* (**I**), m. 152–3° **I** (5 g.) digested 2 days in excess 50% KOH, a large quantity of water added, filtered, the residue washed repeatedly, and dried *in vacuo* over $CaCl_2$, yields the *hydroxymercuri deriv.*, $C_6H_6ONBrHg$, m. 253–4°. Boiling satd. alc. NaBr (1.03 g.) added to boiling satd. alc **I** (4.30 g.), boiled a few min. and cooled, ppts. the *bromomercuri compd.*, $C_6H_5NBr_2Hg$, m. 213–4°. **I** (approx. 4 g) digested 4 hrs. on a water bath with a slight excess of Ac_2O and then 2 hrs. at room temp., filtered, washed with water until neutral, dried *in vacuo* over NaOH, and recrystd. from glacial AcOH, yields the *Ac deriv.* (**II**) of **I**, $C_{10}H_{10}O_3NBrHg$, m. 220 1°. **I** (approx. 3 g.) digested 48 hrs. with excess 50% aq. $Na_2S_2O_3$, water added, and filtered, yields *4,4'-mercuribis-o-bromoaniline*, $[Br(H_2N)C_6H_3]_2Hg$, m. 125°. NaBr (1 mol. per mol. of **II**) in EtOH and then Br (2.03 g.) in glacial AcOH added to **II** (4 g.) in glacial AcOH, let stand 4 hrs., a large quantity of water added, salted out with KNO_3 and the ppt recrystd. from EtOH, yields $2,4$-$Br_2C_6H_3NHAc$, m. 146° (cf. *Ber* **7**, 348), which establishes the constitution of **I**. C. C. D.

Condensation of 4-chloro-3-nitrophenylarsonic acid with some amino substances and particularly with ethylenediamine and piperazine. Reduction of the nitro products to amines. ERNEST FOURNEAU AND A. FUNKE. Pasteur Inst. *Bull. soc. chim.* **43**, 889 95 (1928) -Heating 10 g. of *ethylenediamine* (**I**) and 5 g. of *4-chloro-3-nitrophenylarsonic acid* (**II**) for 1 5 hrs. at 135–40° in the presence of anhyd. NaOAc gave a yellow mass from which 95% of *4-[2-aminoethylamino]-3-nitrophenylarsonic acid* (**III**), $H_2NCH_2CH_2NHC_6H_3(NO_2)AsO_3H_2$, was obtained by dissolving in dil. Na_2CO_3 and pptg. with an equiv. quantity of HCl. **III** was suspended in H_2O and treated with 30% excess Ac_2O, filtered hot and upon cooling 85% of the *Ac deriv.* (**IV**) was pptd. **IV** was reduced by dissolving 11.5 g. in a mixt. of 15 cc. of 10 *N* NaOH and 10 cc. of H_2O and pouring this soln. alternately with 35 cc. of 10 *N* NaOH into 30 g. of H_2O contg. 65 g. of $FeSO_4.7H_2O$. The temp. was held below 50° for 0.5 hr., then cooled to 3°, pptg. most of the Na_2SO_4, filtered and neutralized, pptg. 50% of the *aminophenyl deriv.* of **III**. In the initial condensation, using a 50% aq. soln. of **I**, 80% of *ethylenedi[4-amino-3-nitrophenylarsonic acid]* (**V**), $(CH_2NHC_6H_3(NO_2)AsO_3H_2)_2$, resulted instead of **III**. Reduction of **V** gave 20–5% of the *aminophenyl deriv.* One mol. of **II** and 2.5 mols. of *piperazine-2HCl* in 1.2 l. of 10 *N* NaOH heated for 0.5 hr. and pptd. with HCl gave 65% of *4-piperazine-3-nitrophenylarsonic acid*, $HN:(CH_2CH_2):NC_6H_3(NO_2)AsO_3H_2$. With 5 g. of **II**, 5 g. of piperazine.$6H_2O$ and 2 g. of NaOAc, heating at 110° for 2 hrs., dissolving in Na_2CO_3 and pptg. with HCl gave *piperazinedi-[3-nitrophenylarsonic acid]*, $H_2O_3AsC_6H_3(NO_2)N:(CH_2CH_2):NC_6H_3(NO_2)AsO_3H_2$. Condensation of **II** with Et *p*-aminobenzoate gave *4-[p-carbethoxyphenylamino]-3-nitrophenylarsonic acid*, $EtO_2CC_6H_4NHC_6H_3(NO_2)AsO_3H_2$, which was reduced by $FeSO_4$ to the *aminophenyl deriv.* These compds. were tested on *trypanosomiasis*. A. S. CARTER

Triphenylstibine sulfide. O. Yu. Magidson and B. Süsskind. *Trans. Sci. Chem.-Pharm. Inst. (Moscow)* **6**, 21–8(1923).—Good yields of triphenylstibine sulfide are obtained by a modification of Michaelis and Reese's method, the time of reaction being shortened, and half the usual quantity of Na employed. B. C. A.

Extractibility of phenols from their alkaline solutions by ether. G. Vavon and N. Zaharia. *Compt. rend.* **187**, 346–8(1928).—Phenols may be partially extd. from their alk. solns. by means of Et_2O. The proportion extd. depends on the structure of the phenol. With the introduction of radicals into PhOH, the proportion extd. increases, and is greater for *o*-substituted phenols than for the *m*- or *p*-isomers. The cause for this extractibility lies in a more or less profound hydrolysis of the Na phenolate, but it depends besides on the soly. of the phenol in the phenolate soln. and in Et_2O. The proportions extd. for a no. of phenols varied from 7.5 to 97.7%. For these detns. 0.01 mol. of the phenol and 0.01 mol. NaOH in 10 cc. soln. were extd. with 20 cc. Et_2O at 15° for 10 min. With thymol, the use of different solvents gave the following % extd.: Et_2O 88, benzene 38, CCl_4 25, petroleum ether 22. In the *purification of phenols*, it is recommended that petroleum ether be used for the extn. and that an excess of alkali be employed. In treating a mixt. of 2 phenols with insufficient NaOH to give the phenolates, and extg. with Et_2O, there occurs a fractionation, the less extractible phenol remaining mainly in the alk. soln. This furnishes a method therefore for the *sepn. of* some *phenols.* Frederick C. Hahn

Sodium and potassium phenoxides. A. N. Meldrum and M. M. Patel. *J. Indian Chem. Soc.* **5**, 91–4(1928).—These compds. may be obtained in a state of purity by pptn. of solns. of the phenol in 20% alkali hydroxide with concd. alkali soln. (100–200 g. in 100 g. of water). In this way the following are prepd.: Na phenoxide, m. 59–60°; K phenoxide, m. 103–4°; Na *o*-, *m*-, and *p*-cresoxides, m. below 0°, and 92–4°, and 123–5°, resp.; K *o*- cresoxide, cryst., *m*-, and *p*-, m. about 36° and 92°, resp.; Na *m*-xylyloxide, m. 41–3°; K *m*-xylyloxide, liquid; Na *p*-xylyloxide, m. 83°; K *p*-xylyloxide, m. 35°; Na guaiacoxide, m. 120°; K guaiacoxide, m. 168°; Na eugenoxide, m. 115°; K eugenoxide, m. 128°; Na α- and β-naphthoxides, m. 44–5° and 120°, resp.; K α-naphthoxide, liquid; K β-naphthoxide, m. 38–40°. B. C. A.

Aluminum powder as a synthetic reagent. A. C. Ray and S. Dutt. *J. Indian Chem. Soc.* **5**, 103–10(1928); cf. J. N. Ray (*C. A.* **15**, 1133).—Al powder may be activated for synthetic purposes by heating it in a current of dry H at 500°. The activation is apparently not due to the formation of a hydride or to the removal of a film of Al_2O_3, since that oxide is not reduced under the conditions employed. It is suggested that a film of a suboxide is removed in the activation. Dry distn. of phenol with the activated Al affords benzene and Ph_2; nitrophenols yield aminophenols, NH_3, and benzene. The powder may also be used in typical Ullmann, Freidel-Crafts, and Reformatsky reactions. When used in the reduction of a suspension of $PhNO_2$ in aq. NH_4Cl, it affords PhNHOH at 0° and aniline at the ordinary temp. Under the latter conditions it may be employed in the reduction of Ph_2CO to benzohydrol and in the reduction of azo dyes. B. C. A.

Azopicric acid. K. Elbs and O. H. Schaaf. Univ. Giessen. *J. prakt. Chem.* **120**, 1–35(1928).—Reduction of m-$O_2NC_6H_4OMe$ with Zn and NaOH gives 80% of *m-azoanisole*, orange-yellow, m. 76–7°; nitration with KNO_3 and concd. H_2SO_4 gives the *2,4,6,2',4',6'-hexanitro deriv.*, dark reddish yellow, m. 126°, from AcOH, or red to brownish red, m. 127°, from MeOH. Boiling with H_2O for 15 min. gives *azopicric acid* (I), m. 238°; this behaves as a dibasic acid, but esters could not be obtained and ethers could be prepd. only indirectly; nitration of *m*-azophenetole gives the corresponding *5,5'-di-EtO deriv.*, red to reddish yellow, m. 138–9°. Reduction with NaSH gives, instead of azopicramic acid, *pentanitrodihydroxyphenylphentriazole*, brown amorphous powder, m. 176–80° (decompn.); the NO_2 groups may be catalytically reduced. I and NaOH give a brown smear, which was not investigated; K_2CO_3 gives *trishydroxaminotrihydroxybenzene*, pale yellow, m. 166°, which is easily oxidized to trinitrophloroglucinol; excess of K_2CO_3 gives the K salt of the phenol, the intermediate *bishydroxamino deriv.*, m. 166° (decompn.), and the *monohydroxamino deriv.*, m. 146–8° (decompn.). The absorption curves of I and picric acid are compared. The explosive power of I is somewhat greater than that of picric acid; the explosion proceeds according to the equation: $[(O_2N)_3C_6H(OH)N:]_2 = 12CO + 2H_2O + 8N$. C. J. West

Bi-singlet and the semipolar double bond. H. D. K. Drew. Birmingham Univ. *Chemistry and Industry* **47**, 949–51(1928).—A theoretical paper in which is discussed the formulation of salts of phenoxtellurine and the corresponding Se and S derivs. From the speculation concerning them, D. raises the questions: Can analogous compds., having markedly different properties, be represented adequately by the same type of

electronic formula; is there, or is there not, any real difference in fact between the semipolar double bond (and, what is at all events superficially equiv. to it, the co-ordinate linking of Sidgwick) and the bi-singlet linking, *i. e.*, 2 singlet linkings uniting a pair of atoms? C. J. West

Quadrivalency of selenium. I. 4-Carboxydiphenyl and *p*-carboxyphenyl methyl selenoxides. Wilson R. Gaythwaite, Joseph Kenyon and Henry Phillips. Battersea Polytechnic. *J. Chem. Soc.* **1928**, 2280–7.—The resolution of 4-$H_2NC_6H_4$(4-MeC_6H_4)SO and (4-$HO_2CC_6H_4$)MeSO into their optically active forms (*C. A.* **20**, 3448) showed that the double bond between S and O in these compds. is unsym. and can therefore be considered to be a semipolar double bond. Attempts have now been made to resolve I, II and III (below) but they were unsuccessful; this result, together with the chem. evidence, shows that the linking between the Se and O atoms of a selenoxide may be partly polar in character but at the same time may tend to utilize or render inert the remaining combining capacity of the Se atom in a manner which suggests that the linking may not be an unsym. semipolar double bond. *p*-$MeC_6H_4SO_2Ph$ (116 g.) and 40 g. Se, heated until SO_2 is evolved and after 2–3 hrs. distd., give 35 g. *phenyl p-tolyl selenide*, pale yellow, b_{20} 175–8°; *dibromide*, orange-red, m. 149–50°; with NaOH there results the *selenoxide* (I), m. 131–3°; this also results from the selenide and $KMnO_4$. Attempts to resolve I by means of *d*-camphorsulfonic acid failed. Prolonged oxidation of the selenide with $KMnO_4$ gives *4-carboxydiphenyl selenoxide* (II), m. 253–5° (decompn.); reduction with Zn and AcOH gives the *selenide*, pale yellow, m. 182–4°, whose *dibromide*, yellow, m. 208–10°. II yields a *brucine salt*, m. 130° (decompn.); *l-menthylamine salt*, m. 220–2° (decompn.); $[\alpha]_{5461}$ —16.4° (EtOH, *c* 0.8145); *d-α-phenylethylamine salt*, m. 194 5° (decompn.), $[\alpha]_{5461}$ —12.7° (C_5H_5N, *c* 1.139); in no instance was any resolution observed. *p*-$HO_2CC_6H_4N_2Cl$ and KSeCN in alk. soln., after boiling with 2 *N* NaOH, give *4,4'-dicarboxydiphenyl diselenide*, pale yellow, m. 297°; reduction with Zn in aq. NaOH, followed by Me_2SO_4, gives *p-carboxyphenyl Me selenide*, pale yellow, m. 174°; *dibromide*, orange red, m. 198–9°; the *selenoxide* (III), by oxidation of the selenide with H_2O_2 or the action of KOH on the dibromide, m. 183–4° (decompn.); *brucine salt*, m. 105–10°, on crystn. gives a mixt. of the salt of the selenide and III. **II. The simple halogen derivatives and the dihydroxide of 4-acetamidodiphenyl selenide.** *Ibid* 2287–93.—The primary object of this investigation was to prep. and attempt the resolution of 4-aminodiphenyl selenoxide; however, this proved unstable in the presence of acids. *4-Aminodiphenyl selenide*, m. 93–4°, results by heating a mixt. of benzeneselenonic acid and $PhNH_2$ at 110–5° for 6 hrs.; *HCl salt*, m. 159°; *Ac deriv.* (I), m. 169–70°, decomps. when heated with mineral acids. Oxidation of 5.8 g. I in AcOH with 4 cc. H_2O_2 gives 5.7 g. of the *dihydroxide*, $AcNHC_6H_4SePh(OH)_2$ (II), m. 147–8° (decompn.); Zn and AcOH reduces it to I; warming with 0.5 *N* HCl for 1 hr. also gives I, which is also formed by the action of heat on II. Heated at 20 mm. and 120–30°, there results *4-acetamidodiphenyl selenoxide* (III), m. 144–6°; crystn. from aq. EtOH gives II. III and EtOH-NaOH give *4-aminodiphenyl selenoxide*, m. 188–9°, also obtained from the selenide and H_2O_2. II and concd. HCl in AcOH give *4-acetamidodiphenyl selenide dichloride*, m. 131–2°; the same product is not obtained from I and Cl. The *dibromide*, red, m. 135–6°, results from I and Br in AcOH or II and HBr; Zn in AcOH gives I; NaOH gives II; heating at the m. p. for 0.5 hrs. causes the evolution of HBr and the formation of the *compd.*, $C_{14}H_{11}ONBr_2Se$, m. 167°, possibly 3,5-dibromo-4-acetamidodiphenyl selenide. I and I give the *diiodide*, chocolate-brown, m. 144–5° (decompn.); this also results from II and HI or from the dibromide and KI; heated at its m. p. for 1 hr., I is evolved and I formed, a change which takes palce at room temp. in 10 days. **III. The instability of the compounds of quadrivalent selenium derived from phenyl methyl and phenyl ethyl selenides and phenyl- and *p*-tolylselenoglycolic acids.** Owen J. Kempster Edwards, W. R. Gaythwaite, J. Kenyon and H. Phillips. *Ibid* 2293–303.—On account of their instability, much difficulty has been experienced in the prepn. of selenoxides contg. an alkyl group attached to the Se atom; such selenoxides have been found to decomp. on heating mainly as indicated by the equation $RSeOCH_2R = RSeH + RCH.O$ Sulfoxides behave similarly, and it has been suggested that these undergo an isomeric change by a process analogous to the keto-enol change as the initial step in the decompn. The following study was made to investigate whether such a change occurs in the Se compds. $PhMeSe(CH_2CO_2H)Br$, from PhMeSe and $BrCH_2CO_2H$, on heating at 110°, gives MeBr and $PhSeCH_2CO_2H$, b_{10} 197–8°, m. 36–7°. The reverse of this reaction could not be accomplished. Br in CCl_4 gives the *dibromide*, yellow, m. 126°; the soln. in 10 parts of hot glacial AcOH deposits PhSeBr on cooling. At its m. p. it decomps. mainly into PhSeBr and $BrCH_2CO_2H$. *p*-$MeC_6H_4SeMe(CH_2CO_2H)Br$ behaves similarly, giving *p*-$MeC_6H_4SeCH_2CO_2H$,

whose dibromide, m. 103–4°, on heating at its m. p. for a few min., gives $BrCH_2CO_2H$ and probably *p*-bromoselenotoluene, a reddish brown oil; the *dibromide*, red, m. 113–4° (decompn.). *Ph Me selenide dibromide*, yellow, m. 115–6° (decompn.); heated at 120–30° for 10 min. it gives MeBr and PhSeBr; with KI there results the *diiodide*, purple, m. 69–71°, if at 40°, or the *bromoiodide*, red, m. 85° (decompn.), if in the cold; the latter on heating at 100° gives PhSeBr and MeI; this mode of decompn. is not inconsistent with the view that such decompns. pass through a preliminary phase, which involves the loss of a proton by the Me group and causes this group to be less firmly attached to the Se atom. With Ag_2O in H_2O the dibromide gives a dihydroxide, a viscous oil which could not be entirely freed from H_2O without decompn.; heating at 100° and 15 mm. or 170° and 760 mm. gives PhMeS, Ph_2Se_2 and HCHO. *Ph Et selenide dibromide*, light red, m. 84°; heating at 130° for 10 min. gives PhSeBr and EtBr. PhEtSe and $BrCH_2CO_2H$ give $PhSe(CH_2CO_2H)$. The main course of the reaction of the decompn. of Ph_2SeBr_2 by heat is to give $PhSeC_6H_4Br$ and HBr. C. J. West

Organic sulfur compounds. IX. Preparation of aromatic thio ketones by the action of thioacetic acid on ketone chlorides. Action of copper-bronze on thiobenzophenone and its derivatives. A. Schönberg, O. Schütz and S. Nickel, with H. Krüll, W. Marschner and F. Kaplan. Techn. Hochschule Charlottenburg. *Ber.* **61B**, 1375–85(1928); cf. *C. A.* **22**, 587.—Numerous compds. of the $CSPh_2$ series can be obtained easily and in good yield from AcSH and aromatic ketone chlorides. $CSPh_2$ itself has for the 1st time been obtained perfectly pure by this method. The reaction $Ar_2CS \longrightarrow Ar_2C.CAr_2$, effected by Gattermann by heating the Ar_2CS with Cu-bronze at 200–20°, gives purer products when it is carried out in xylene. $CSPh_2$ reacts smoothly, $(p\text{-}MeOC_6H_4)_2CS$ (I), $(3,4\text{-}Me(EtO)C_6H_3)_2CS$ (II), *xanthione* (III) and *thioxanthione* (IV) less readily, while Michler's thio ketone (V) and *N-phenylthioacridone* (VI) are quite resistant. $CSPh_2$ (28 g. from 50 g. Ph_2CCl_2 slowly treated at 80° under pure dry CO_2 with 50 g. AcSH, then heated 3 hrs. at 90° and 4 hrs. at 100° and fractionated, first under a low and finally under a high vacuum), deep blue oil, $b_{0.05}$ 126–9°, seps. from petr. ether (4 g. in 20 cc.) in ice in blue needles, m. 51°, gives in Et_2O with $HgCl_2$ a compd. $Ph_2CS.HgCl_2$ or $[Ph_2CSHgCl]Cl$, reacts vigorously (under N) in Et_2O with PhMgBr, at once changing from blue to red. In the air the blue crystals quickly deliquesce and after long standing and frequent stirring change to a dirty gray-blue solid mass from which, by recrystn. from ligroin, can be obtained a well-crystd., S-contg., colorless substance, decompg. above 100° with formation of a blue color and forming in the cold colorless or faintly blue solns. which become deep blue on heating. *4,4'-Diphenylthiobenzophenone*, from $(p\text{-}PhC_6H_4)_2CCl_2$ and 3 mols. AcSH refluxed 14 hrs. in C_6H_6 under CO_2, green-blue, m. 228–9°. *4-Methoxy-4'-ethoxybenzophenone* (19 g. from 25 g. $p\text{-}MeOC_6H_4COCl$, PhOEt and $AlCl_3$ in CS_2), m. 112°, sol. in concd. H_2SO_4 with yellow color, converted into the dichloride by refluxing with $(COCl)_2$; *thio ketone*, dark blue, m. 94–6°, sol. in concd. H_2SO_4 with yellow, somewhat reddish color. *2,2'-Dimethoxythiobenzophenone*, dark blue, m. 121°, sol. in the ordinary solvents with blue, in liquid SO_2 with red color, gives in Et_2O with $HgCl_2$ deep red crystals. I (4.4 g. from 7.5 g. $(MeOC_6H_4)_2CO$ through the dichloride), deep blue, m. 114–5°. III (3.5 g. from 5 g. xanthone), m. 156°. IV, black needles with somewhat greenish surface luster, m. 168°, sol. in the usual solvents with green color, gives with $HgCl_2$ in Me_2CO red needles, dissolves in concd. H_2SO_4 with orange-red color. VI (62% from *N*-phenylacridone refluxed in C_6H_6 with P_2S_5), red, m. 227–8°. Boiled in xylene with Cu-bronze to disappearance of the blue color (45 min.), 3.3 g. $CSPh_2$ gives 2.1 g. $Ph_2C:CPh_2$; 0.5 g. I yields 0.4 g. $[(p\text{-}MeOC_6H_4)_2C:]_2$, m. 183°; $(p\text{-}EtOC_6H_4)_2CS$ and II behave in the same way; V is unchanged after 24 hrs. boiling; 0.5 g. III in 4–5 hrs. gives 0.35 g. *dixanthylene*, faintly yellowish, somewhat greenish needles; IV in 5 hrs. yields *dithioxanthylene* (VII), does not m. 340°. (Since this paper was written, the dissertation of Lorenz (*Breslau*, **1927**), describing pure IV, m. 176°, and VII, m. 365°, has come to hand; cf. also Arndt and Lorenz, *C. A.* **22**, 2563.) C. A. R.

Thiobenzophenone. H. Staudinger and H. Freudenberger. Eidgen. Techn. Hochschule Zürich u. Univ. Freiburg i. Br. *Ber.* **61B**, 1576–83(1928).—The results of this work, part of which was done in 1920 (cf. *C. A.* **15**, 518) with E. Senn and I. Siegwart, are published now because of the appearance of the paper of Schönberg, Schütz and Nickel (preceding abstr.). The colorless addn. product of Ph_2CS (I) and $Ph_2C:CO$ decomps. at its m. p. (180–1°) into its components which cannot be sepd. by fractional distn. and recombine on cooling, but if 1 mol. PhCH:NPh is added it reacts only with the $Ph_2C:CO$ to form a stable, high-boiling lactam and pure I, deep violet, m. 54–5°, can now be obtained by distn. in a high vacuum. A study of the Gattermann method of prepn. showed that even when the air is rigorously excluded it is not possible to obtain

a product contg. more than 30–50% Ph_2CS, as the Ph_2CCl_2 is partially converted into Ph_2CO by the alkali. By treating the Ph_2CCl_2 in alc. with the calcd. quantity of NaSH instead of Na_2S (the NaSH must be added to the Ph_2CCl_2 and not *vice versa*, as otherwise the I is reduced by the NaSH to $(Ph_2CHS)_2$ (II)) a deep blue oil can be obtained which contains about 75% I and yields almost pure I on fractional distn. and recrystn. from alc. The polymer, m. 146°, of I which Siegwart (*Diss. Zürich*, **1917**) believed he had obtained from Ph_2CCl_2 and K_2S in excess was really chiefly **II**, m. 152–3°, contaminated with a little S. Ph_2CO (20 g.) in 100 cc. 96% alc. treated cold for 2–3 hrs. with dry H_2S and HCl, then 20 hrs. with H_2S, gives 15 g. pure **I**, which by this method is made a very readily available compd. Pure **I** does not polymerize even after a yr. either of itself or on addn. of C_5H_5N, NMe_3 or PH_3 or treatment with HCl gas. With Na_2S or NaSH, even more readily with $(NH_4)_2S$, it is reduced in alc. to **II**. NaOEt likewise reduces it to **II** but with partial formation of Ph_2CO and other by-products. **II** is also obtained quant. from Ph_2CHSH and the calcd. quantity of **I**, from Ph_2CO and $(NH_4)_2S$, most conveniently from Ph_2CCl_2 and excess of NaSH; Al-Hg reduces it to Ph_2CHSH, which on heating decomps. into S and Ph_2CH_2. As already pointed out, the C:S group in **I** is far more reactive than the C·O group in Ph_2CO. **I** reacts very rapidly with $Ph_2C·CO$ in the cold and readily with aliphatic diazo compds. to form ethylene sulfides, with $PhNH_2$ and especially with $PhNHNH_2$, but does not condense with AcH, Me_2CO or AcOEt. At 160–70° it decomps. into $(Ph_2C:)_2$ and S. With HCl and concd. H_2SO_4 it forms brown addn. products hydrolyzed by H_2O. It readily undergoes autoxidation, yielding Ph_2CO, a little S and SO_2 and a trisulfide m. 124°. C. A. R.

The determination of gossypol structure. E. P. CLARK. *Oil and Fat Ind.* **5**, 273–7(1928).—The action of 40% NaOH at steam bath temp. on gossypol produces HCO_2H and a phenolic substance, called apogossypol, which is a colorless cryst. material having no definite m. p. It is sol. in org. solvents and dissolves freely in dil. alkali from which it is pptd. by CO_2. The alk. solns. darken at once and become purple, and even a few hrs.' exposure of the cryst. apogossypol causes it to change to a black powder. It readily forms colorless cryst. Ac and MeO derivs. and a study of these has shown that the formula for apogossypol is $C_{28}H_{30}O_6$. From a consideration of the formula for gossypol, $C_{30}H_{30}O_8$, it is seen that hot alkali removes 2 C:O groups and since HCO_2H alone is produced the C:O groups must be eliminated as HCO_2H and each mol. of gossypol should produce 1 mol. of apogossypol and 2 mols. of HCO_2H and the yield of these substances obtained corresponded to 97.5 and 95.3% of theory. The toxicity of apogossypol was found to be $^1/_3$ of that of gossypol and its action seems to be restricted to the development of acute toxic symptoms. The oxidation of gossypol in NaOH with $KMnO_4$ at 0° gave evidence of volatile fatty acids and, after steam distn., formic, acetic and isobutyric acids were found. Biol. expts. on rats showed that 0.05% of pure gossypol in food produced a retardation of the growth rate and 0.2% caused loss of wt. and death. E. SCHERUBEL

Dibenzyl ether as a cryoscopic solvent. GEORGE MACDONALD BENNETT AND GERVASE H. WILLIS. Univ. of Sheffield. *J. Chem. Soc.* **1928**, 2305–7.—$(PhCH_2)_2O$ b_{28} 184, b_{16} 170°, m. 3.60, $d_4^{10.5}$ (vac.) 1.0504, d_4^{20} (vac.) 1.0428; it often remained for hrs. in the supercooled state, but crystn. could always be induced by vigorous stirring at a temp. below —15°. The following values of the f. p. const. *K* were found: PhOEt, 62.6; $C_2H_4Br_2$, 61.8; $PhNMe_2$, 62.8; $C_{10}H_8$, 63.6; from the mean value, 62.7, the latent heat of fusion of $(PhCH_2)_2O$ is calcd. to be 24.4 cals. per g. A few f. p. observations were also made with BzOH, AcOH and $PhCH_2OH$ as solutes; the apparent mol. wts. in C_6H_6 and $(PhCH_2)_2O$ are: BzOH, 228–36, 147–77; AcOH, 115–22, 91.6–109; $PhCH_2OH$, 116–65, 135–40. C. J. WEST

Monoacetals of α-bromodibenzoylmethane. CHARLES DUFRAISSE AND ALFRED GILLET. *Bull. soc. chim.* **43**, 883–8(1928).—*α-Ethoxybenzalacetophenone* (17.5 g.) was dissolved in 360 g. of dry CS_2, cooled with ice-salt mixt. and to this was added 11.5 g. of Br in 30 g. of CS_2 followed immediately by 30 g. of KOAc in 250 cc. of abs. EtOH. After boiling, this was poured into H_2O, sepd., washed with $NaHCO_3$ soln. and distd. under diminished pressure, giving 78% of *α-bromo-α,α-diethoxy-benzylacetophenone* (**I**), $BzCHBrC(OEt)_2Ph$, m. 70°. Likewise the following were prepd.: *di-MeO deriv.*, m. 91–2°, and *di-PrO deriv.*, m. 83–4°. These acetals were also prepd. according to the following example: 1 g. of *α-bromo-α-ethoxybenzalacetophenone* (**II**) and 0.5 g. of Na in 7 g. of abs. EtOH were sealed and held at 0° for 36 hrs., giving 95% of **I** after distn. By this method, 50% of the *α-methoxy-α-ethoxy mixed acetal*, m. 89–90°, was prepd. using MeOH and **II**. A. S. CARTER

The Nierenstein reaction. M. NIERENSTEIN. Univ. Bristol. *Nature* **122**, 313(1928).—Bradley and Robinson (*C. A.* **22**, 3412) have failed to get satisfactory yields

of —$PhCOCH_2Cl$ because they have modified M.'s original method. Cf. *C. A.* **10,** 44.
R. J. HAVIGHURST

Isoeugenol. SCHIMMEL AND CO. *Schimmel and Co., Ann. Rept.* **1927,** 138; *Chem. Zentr.* 1927, II, 1472.—An isoeugenol was obtained in large water-white crystals, m. 32°, and stable at room temp. in the absence of air. The two modifications can be explained on the basis of *cis-trans*-isomerism. The liquid form is a mixt. of the malenoid and fumaroid forms.
J. S. REICHERT

Nitration of piperonal. JOHN B. EKELEY AND MARGARET S. KLEMME. Univ. of Colorado. *J. Am. Chem. Soc.* **50,** 2711–5(1928).—Repetition of earlier expts. (*C. A.* **16,** 3313) confirms the existence, in com. Kahlbaum nitropiperonal, of an *isomer* (I), m. 143°; this was found both by means of the previously reported derivs. and by fractional crystn. of the K. product. In an attempt to prep. I, piperonal was nitrated under varying conditions of temp. and of HNO_3 concn. with and without H_2SO_4 in the presence and absence of catalytic agents and in the presence and absence of sunlight. Besides the *o*-nitropiperonal, m. 98.5°, mono- and dinitromethylenecatechols, nitropiperonylic acid and an isomeric *mononitromethylenecatechol* (II), yellow, m. 70°, are obtained. Increase in temp. in general causes an increase in oxidation products. Beyond a HNO_3 of d. 1.38, increase in acid concn. also causes an increase in oxidation products. The presence of nitrosulfonic acid causes a decrease in oxidation and an increase in nitration; the presence of glacial AcOH causes an increase in the nitration, but the best yield of nitropiperonal was obtained with HNO_3 of d. 1.38 at 45°; no trace of I was found. The isomeric I is probably formed as an intermediate product in the expts. using fuming HNO_3, as indicated by the isolation of II from the reaction mixt. Yields are given for 21 nitration expts.
C. J. WEST

The identity of volemitol and α-sedoheptitol. F. B. LAFORGE AND C. S. HUDSON. *J. Biol. Chem.* **79,** 1–3(1928).—The data concerning volemitol and its derivs. recorded in several standard compilations contain so many erroneous statements that it was thought advisable to give briefly a correct record of the exptl. data that have been published together with the evidence leading to the conclusion that volemitol and α-sedoheptitol are identical.
A. P. LOTHROP

Action of diazomethane on piperonal. ERICH MOSETTIG. Univ. Wien. *Ber.* **61B,** 1391–5(1928); cf. Arndt, *C. A.* **22,** 2930.—In connection with A.'s observations on the anomalous behavior of certain aldehydes with CH_2N_2, M. reports some astonishing results he obtained in an attempt to prep. acetopiperone (I) from piperonal (II) and CH_2N_2. When solid II at about —15° is treated with excess of CH_2N_2 in Et_2O to which MeOH has been added to accelerate the reaction there is obtained an almost colorless oil boiling *in vacuo* quite const. and without the least decompn. On working up, this yields about 6% I, 20% piperonylacetone (III) and, as chief product, an alkali- and acid-insol. mobile oil (IV) of intense and pleasant odor, which distils *in vacuo* without decompn., shows neither ketone nor aldehyde properties, becomes faintly yellow in the air only after several weeks, has a simple mol. wt and the compn. $C_{10}H_{10}O_3$, *i. e.*, IV is isomeric with III and two CH_2 groups have reacted with the II. Sepn. of the 3 products is difficult. The vacuum-distd. crude product is freed of III by shaking in Et_2O with aq. $NaHSO_3$, then of thick substances very difficultly sol in petr. ether by digesting with that solvent; after distg., most of the I crysts. out (the rest cannot be removed as the semicarbazone because of the sensitivity of the IV to AcOH (or $H_2NCONHNH_2$)); another fractional distn. now gives a IV of const. b. p. and the calcd compn. but still contg. detectable quantities of I. At present only conjectures can be made as to the structure of IV; the absence of MeO precludes its being a 3,4-methylenedioxy-α-methoxystyrene; its pleasant odor might be taken as an indication of an oxide structure (which would also be supported by A.'s results), that of an α-[3,4-methylenedioxyphenyl]propane α,γ-oxide being the most probable (the non-identity of IV with safrole or isosafrole oxide was proved by direct comparison). All attempts to establish the constitution of IV by various reactions (which, however, have been made only on small quantities because of lack of material) have yielded non-crystallizable oily and resinous products. Preliminary expts. with *o*- and *m*-veratraldehyde indicate that these also give other products besides the ketone with CH_2N_2. The addn. of MeOH and the form in which the aldehyde is used (solid or in soln.) has a great influence on the course of the reaction; *e. g.*, II in Et_2O with CH_2N_2 also in Et_2O gives I as chief product with only a vanishingly small quantity of IV.
C. A. R.

Reaction between the binary system, magnesium + magnesium iodide, and aromatic acids and acid derivatives. M. GOMBERG AND W. E. BACHMANN. Univ. of Michigan. *J. Am. Chem. Soc.* **50,** 2762–9(1928).—Org. acids in soln. in Et_2O and C_6H_6 react vigorously with the binary system Mg + MgI_2, H is evolved and the acid is con-

verted completely into the salt RCO_2MgI. This salt then undergoes reduction and, at least in the case of aromatic acids, the reduction product is R(IMgO)C:C(OMgI)R, which, when hydrolyzed, gives rise to the corresponding benzoin in yields of 30–75%. The reducing effect of the binary system is ascribed to the intermediate formation of the compd. MgI. Alkyl esters of aromatic acids and acyl peroxides are reduced by the binary system in a similar manner. Aryl esters are affected differently. The following % H liberated was found for the reaction $RCO_2H + Mg + MgI_2$: BzOH, 89; *p*-$MeC_6H_4CO_2H$, 81; α-$C_{10}H_7CO_2H$, 86; β-$C_{10}H_7CO_2H$, 93; $PhCH_2CO_2H$, 117; Ph_2CHCO_2H, 97; $C_{18}H_{36}O_2$, 87. The formation of H depends primarily upon the liberation of HI ($RCO_2H + MgI \rightleftharpoons RCO_2MgI + HI$), which then reacts with Mg($Mg + 2HI \longrightarrow MgI_2 + H_2$). Expts. are reported which confirm this equil. A mixt. of Mg + MgI from 95 g. I and 20 g. Mg in 100 cc. Et_2O and 200 cc. C_6H_6, treated with 30.5 g. BzOH, gives 30–43% of benzoin; *p*-$MeC_6H_4CO_2H$ gives 30% of dimethylbenzil; α-$C_{10}H_7CO_2H$ gives 30–5% α-naphthoin; β-$C_{10}H_7CO_2H$ gives 70–5% of *β-naphthil*, cream, m. 157–8°; *p*-$PhC_6H_4CO_2H$ gives 40% of *p,p'*-diphenylbenzil. $BzOCH_2Ph$ (53 g.) and 70 g. MgI in Et_2O-C_6H_6, heated on the steam bath for 1 week, give 30.32 g. BzOH and 20 g. $PhCH_2I$. Reduction of $BzOCH_2Ph$ gives 70% of $(PhCH_2)_2$ and 45% benzoin. BzOMe (34 g.) gives only 2.2 g. benzoin, the MeI reacting with the Mg to form a Grignard reagent, which in turn reacts with the ester or salt. BzOPh gives 90% of PhOH. Bz_2O_2 and MgI_2 in Et_2O-C_6H_6 liberate I quant., forming BzOH; reduction gives 45% of benzoin. The reduction of acids or of esters by this binary system offers a convenient method of obtaining benzoins. It should prove particularly useful in those instances when the aldehyde requisite for the usual benzoin condensation is not readily accessible. C. J. West

Action of phosgene on polypeptide-like derivatives of *p*-aminobenzoic acid. Formation of 1,3-substituted hydantoins. Caspar Tropp. Inst. Schiffs- u. Tropen-Krankheiten, Hamburg. *Ber.* **61B**, 1431–9(1928).—Germanin, a very large mol. built up of aromatic amino acids in polypeptide-like combination and doubled in size by conversion with $COCl_2$ into a urea deriv., has opened up an entirely new path in the field of modern chemotherapy. Attempts were made to convert the polypeptide-like glycyl and polyglycyl derivs. of *p*-$H_2NC_6H_4AsO_3H_2$ (cf. Giemsa and T., *C. A.* **21**, 70) in the same way into urea derivs. With the 1st member of the series, $H_2NCH_2CONHC_6H_4AsO_3H_2$, all such attempts failed; there was formed a non-cryst. gluey product of high mol. wt. drying to a glassy brittle mass. To study the mechanism of the reaction *p*-$H_2NC_6H_4CO_2H$ was substituted for the expensive atoxyl. $CO(NHCH_2CONHCH_2CO_2H)_2$ (I) is readily made by the Fischer method with $COCl_2$ and its prepn. has been materially simplified so that it can be obtained in 1 operation, without esterification or isolation of any intermediate product, from glycine anhydride. The complete absence of urea formation in T.'s expts. must therefore be due to the aryl substitution in the NH_2 group. *Glycyl-p-aminobenzoic acid* (II) cautiously treated in the cold with $COCl_2$ gave, not the urea, but *3-[4'-carboxyphenyl]hydantoin* (III). The *iminobis[acetyl-p-aminobenzoic acid]* (IV), formed as by-product in the prepn. of **II**, gives on similar treatment *1-[acetyl-p-aminobenzoic acid]-3-[4'-carboxyphenyl]hydantoin* (V), and *N-[(isoamylamino)acetyl]-p-aminobenzoic acid* (VI) yields *1-isoamyl-3-[4'-carboxyphenyl]-hydantoin* (VII). The Ph residue substituted on the N of the amide makes the other H atom so labile that the $COCl_2$ prefers the ring closure to urea formation. But the 2nd point of anchorage, the NH_2 group (and especially its substituents), is of the greatest significance in the formation of the 5-membered ring. As easily as the hydantoin is formed in the above cases, just as completely does it fail to be formed when, adjacent to the amine, there is a C:O group belonging to a mol. which has other negative substituents, as in *[chloroacetyl]glycyl-p-aminobenzoic acid* (VIII) and *[phenylureido]-acetylglycyl-p-aminobenzoic acid* (IX). The above syntheses show that a large no. of otherwise rather difficultly accessible 1,3-substituted hydantoins can be obtained easily and in good yield with $COCl_2$ (cf. Biltz and Slotta, *C. A.* **21**, 1794, who do not even mention the $COCl_2$ method in their enumeration of the methods of prepg. hydantoins because up to the present it had no practical application). The mechanism of the reaction with polyglycyl compds. of the above type is very complex; *diglycyl-p-aminobenzoic acid* (X) gives a non-cryst. product of high mol. wt. whose structure it has not yet been possible to establish. I is obtained in 55% yield from 5 g. glycine anhydride shaken 15 min. in 50 cc. *N* NaOH, then slowly treated in the cold with 8 g. of 25% $COCl_2$ in PhMe. *N-Chloroacetyl-p-aminobenzoic acid* (XI) (96.8% from *p*-$H_2NC_6H_4CO_2H$ in NaOH under a layer of Et_2O with $ClCH_2COCl$), m. 257–8°, gives with 10 parts concd. NH_4OH at incubator temp. 81% **II**, needles with 1 H_2O, m. 229° (decompn.). **IV**, which may become the chief product of the reaction if the **XI** is first mixed with H_2O

to a stiff paste and then treated with 3.5 parts concd. NH_4OH, decomps. above 250°. **III** (64% from **II** in NaOH under PhMe with $COCl_2$), begins to m. 258–60° (decompn.) on rapid heating, gives the Jaffé reaction with picric acid. **V** (1.7 g. from 3.7 g. **IV**), does not decomp. 270°. **VI.** *HCl* (2.5 g. from 6.3 g. **XI** and iso-$AmNH_2$), m. 285°. *[Diisoamylaminoacetyl]glycyl-p-aminobenzoic acid·HCl*, from **VIII** and (iso-Am)$_2$O in C_5H_5N, m. 253°. With hot C_5H_5N alone, 2.7 g. **VIII** gives 92% *[(p-carboxyphenyl)amino]glycylacetylpyridinium chloride*, crystals with 1.5 H_2O, m. 258°. **VII**, m. 189°. **VIII** (93% from **II** and $ClCH_2COCl$). **IX** (73% from **X** and PhNCO), m. 242°. **X** (5 g. from 8 g. **VIII** with concd. NH_4OH), m. 233°. C. A. R.

Reactions of α,β-unsaturated dinitriles. Ben B. Corson and Roger W. Stoughton. Middlebury College. *J. Am. Chem. Soc.* **50**, 2825–37(1928).—Condensation of $CH_2(CN)_2$ with the appropriate aldehyde, using piperidine or other alk. reagents, gives the following derivs. of *malononitrile;* benzal, m. 83.5–4° (96% yield), causes sneezing and tears; *p*-methoxybenzal, m. 114.5–5° (93%), *o-methoxybenzal*, straw, m. 84–4.5° (90%); *p-hydroxybenzal*, lemon, m. 188.5–9.5° (77%); *m-nitrobenzal*, light cream, m. 104.5–5° (90%), causes sneezing; *3,4-methylenedioxybenzal*, lemon, m. 199–200° (96%). *o-chlorobenzal*, m. 95–6° (85%), causes sneezing and is a skin irritant; *cyclohexylidene*, pale straw, m. 173.5–4.5° (30%); *3-methoxy-4-hydroxybenzal*, lemon, m. 133.5–4.5° (85%); fural, m. 72.5–3° (80%). These closely resemble α,β-unsatd. aldehydes and ketones in that they dissolve in $NaHSO_3$, are oxidized by $KMnO_4$, are reversed into the original components by NaOH and add the elements of HCN. By the reaction of KCN in EtOH, followed by addn. of HCl, the following derivs. of *α,β,β-tricyanoethane* were prepd.: *α-Ph*, m. 124.5–5° (90%); *α-[p-methoxyphenyl]*, cream, m. 122–2.5° (95%); *α-[o-methoxyphenyl]*, cream, m. 140.5–1° (95%); *α-[3,4-methylenedioxyphenyl]*, light orange, m. 153–3.5° (80%). In some cases the intermediate *K deriv.* was analyzed. The nitriles are readily sol. in NH_4OH and are recovered on acidification. From the NH_4 salts, the Ag salts are obtained with $AgNO_3$; the pure white salt darkens in the light. $PhCH(CN)CH(CN)_2$ and MeI give the Me deriv., $PhCH(CN)CMe(CN)_2$, m. 83–4°, whose structure was established by hydrolysis to $HO_2CCHPhCHMeCO_2H$, m. 182–3°. This acid was also synthesized as follows: PhCH:C(CN)CO_2Me and HCN give *Me β-phenyl-α,β-dicyanopropionate*, m. 100–1°; MeI gives the *α-Me deriv.*, m. 87–8°, hydrolyzed to the above acid, m. 182–3°. *p*-Methoxyphenylsuccinic acid, m. 207–8°; *di-Me ester*, m. 93–4°. *o-Methoxyphenylsuccinic acid*, m. 184–5°. C. J. West

Preparation of ethyl phenylmalonate and of 5-phenyl-β-hydroxyethylbarbituric acid. Wm. L. Nelson and Leonard H. Cretcher. Mellon Inst. of Industrial Research. *J. Am. Chem. Soc.* **50**, 2758–62(1298).—Detailed directions are given for the prepn. of $PhCH(CN)CO_2Et$ from $PhCH_2CN$ and Et_2CO_3 with $NaNH_2$ in Et_2O (70.3% yield) and its sapon. to $PhCH(CO_2Et)$ (**I**) by dry HCl in EtOH (78.3% yield); the Na salt with EtI gives 61% of the Et deriv. (**II**), b_{10} 170°, d_4^{23} 1.071. Heating 2.64 g. **II** with 0.69 g. Na in 11 g. abs. EtOH and 0.9 g. $CO(NH_2)_2$ for 3 hrs. at 115° gives 35% of 5-phenylethylbarbituric acid, m. 173–4°. Heating the Na compd. of **I** and $ClCH_2CH_2$-$OCH{:}CH_2$ at 140–50° for 14 hrs. gives 52% of *Et phenylvinyloxyethylmalonate*, b_{17} 196–7°, d_4^{20} 1.098; condensation with $CO(NH_2)_2$ gives 10% of *5-phenyl-β-hydroxyethylbarbituric acid* (hydroxyluminal), m. 200°; $CS(NH_2)_2$ gives 15% of the *2-thio deriv.*, m. 167°. *Phenylvinyloxyethylacetonitrile*, b_8 147°, d_4^{27} 1.029. C. J. West

β-Phenylethylmaleic acid and the isomeric β-phenylethylfumaric acid. P. Cordier. *Compt. rend.* **186**, 869–72(1928).—α-Hydroxy-α-acetonyl-γ-phenylbutyric acid (Bougault, *C. A.* **6**, 3273) is dehydrated by HCl to give α-[β-ketopropylidene]-γ-phenylbutyric acid, m. 95°. An aq. NaOH soln. of the mixt. of dibasic acids obtained by oxidation of the latter with alk. NaOCl yields, on acidification with AcOH, *Na H β-phenylethylmaleate* (the corresponding *acid*, m. 104°, affords the *anhydride*, m. 74°, on treatment with Ac_2O or with dil. HCl) *β-Phenylethylfumaric acid*, m. 202°, obtained from the mother-liquors, does not yield an anhydride under the former conditions. Both acids are reduced to β-phenylethylsuccinic acid by Na-Hg and the substituted fumaric acid is partly converted into its isomeride on treatment with $NaHSO_3$. B. C. A.

Reduction of monohydroxybenzoic acids by catalytic hydrogenation. Fr. Balaš and Alex. Kosík. Charles Univ., Prague. *Casopis Ceskoslovenského Lékárnictva* **7**, 105–7, 118–21, 136–8, 191–2(1927).—Reduction of aq. *o*-$HOC_6H_4CO_2H$ at 60° by H_2 in presence of colloidal Pt yields cyclohexanol as the final product. By analogous reduction of the *m*- and *p*-acids, hexahydrobenzoic acid is formed. W. J. H.

Derivatives of salicylic acid. I. 3-Nitro- and 5-nitrosalicylic acids. A. N. Meldrum and N. W. Hirve. *J. Indian Chem. Soc.* **5**, 95–101(1928). Nitration of

salicylic acid by the method of Meldola, Foster, and Brightman (*C. A.* **11,** 2459) yields a mixt. of 3-nitrosalicylic acid, m. 148–9° (+H_2O, m. 18–9°), and 5-nitrosalicylic acid, m. 228° (22.5 g. and 50 g., resp., from 100 g. of salicylic acid), which is best sepd. by crystn. of the K salts. A neutral soln. of the mixt. in KOH deposits the *mono-K salt* of the 3-nitro acid (yellow; corresponding *Na salt,* crimson), while treatment of the mother-liquors with excess of KOH yields the *di-K salt* of the 5-nitro acid (yellow; corresponding Na salt, yellow). Me 3-nitrosalicylate, m. 132° [the ester, described by Keller (*C. A.* **2,** 2086) is probably a mixt. of the isomeric esters; corresponding Et ester, m. 48.5°; corresponding amide, m. 155° (K salt, +H_2O, described)], and Me 5-nitrosalicylate, m. 119° [corresponding Et ester, m. 102°; corresponding amide, m. 225° (K salt, +H_2O, described)], are prepd. in the usual ways. B. C. A.

Derivatives of salicylylsalicylic acid. E. Lewicka. *Bull. acad. sci. Cracovie* **1927A,** 4 pp.—The following compds. are described: acetylsalicylyl chloride; *Me* (m. 82–4°) and *Et* (m. 72–3°) *acetylsalicylylsalicylates; Me methylsalicylylsalicylate,* m. 102–4°. B. C. A.

Synthesis of the β-acid (2,6-dihydroxyquinoline-4-carboxylic acid) obtained from crude oryzanin by hydrolysis. Yoshikazu Sahashi. *Biochem. Z.* **189,** 208–13(1927).—See *C. A.* **21,** 3904. S. Morgulis

Azo compounds of tyrosine. A. Morel and P. Sisley. *Bull. soc. chim.* **43,** 881–3(1928); cf. *C. A.* **22,** 1857.—Diazotizing with dil. HNO_2 and coupling with β-naphthol (I) produces *fibroinazo-β-naphthol* (II) in silk due to reactions of *tyrosine* (III). A study has been made of this reaction on III to det. whether the aliphatic NH_2 is eliminated, thus indicating whether III remains an integral part of the fiber when II is formed. Only a part (max 40%) of the NH_2 is liberated when III is treated with HNO_2 in the cold and dark. III (18 g.) was dissolved in 65 cc. of HCl and dild. to 2 l. The soln. was cooled to 10° and, while in the dark, a soln. contg. 35 g. of $NaNO_2$ in 500 cc. of H_2O was added during 1 hr. After standing cold and dark for 36 hrs., it was poured into a soln. of 15 g. of I in 1 l. of 0.7% NaOH contg. NH_4OH equiv. to the HCl and excess HNO_2. After 48 hrs. in the dark, HOAc gave 9 g. of red ppt. which was filtered off and washed. Crystn. from EtOH gave 2 compds., the more sol. one (IV) in the smallest quantity, the 2nd (V) being formed exclusively if the quantity of nitrite was decreased. The product is insol. in H_2O and sol. in alkalies, giving a blue which changes to red-brown with excess alkali. Silk dyed with this is not exactly the same shade as that formed directly in the fiber and is much less fast. This indicates a difference between II and the deriv. of III. V is *tyrosineazo-β-naphthol,* $HOC_{10}H_6N_2C_6H_3(OH)$-$CH_2CH(NH_2)CO_2H$, in which N_2 is *o* to the OH. IV is the corresponding *p-hydroxyphenyllactic acid deriv.,* $HOC_{10}H_6N_2C_6H_3(OH)CH_2CH(OH)CO_2H$. A. S. Carter

Oxidative degradation of carboxylic acids. Siegfried Skraup and Emil Schwamberger. Univ. Wurzburg. *Ann.* **462,** 135–58(1928).—Spiro (*C. A.* **16,** 1931) has shown that there is an oscillation in oxidation of fatty and arylfatty acids in the organism. S. and S. have sought to det if there is such a periodic behavior of these acids in their oxidation in the lab. In most of the expts. 1 mol. of the acid in 2 equivs. of K_2CO_3 were oxidized with 0.1 mol. $KMnO_4$ (3 atoms O). $PhCH_2CO_2H$, after 120 min., gives 0.89 mol BzOH (I); $PhCH(OH)CO_2H$, after 90 min., gives 0.38 mol. I and 0.26 mol. $BzCO_2H$ (II); $BzCO_2H$, after 360 min., gives 0.74 mol. I; since $PhCH_2$-CO_2H gives II only in about 50% of the expts., $PhCH(OH)CO_2H$ is not an intermediate product in its oxidation. $PhCH_2CH_2CO_2H$, after 120 min., gives 0.24 mol. I and 0.14 mol. II; $BzCH_2CO_2H$, after 15 min. ($KMnO_4$ dropped into the acid), gives 0.41 mol. I, 0.46 mol. $(CO_2H)_2$ and some PhAc; if the acid is added to the $KMnO_4$, there results 0.07 mol. I, 0.28 mol. II and traces of $(CO_2H)_2$; in the first case, the acid reacts principally as the enol. form, $PhC(OH):CHCO_2H$, for the isomeric $PhCH_2COCO_2H$ (about 10% enolized) gives 0.14 mol. BzH, 0.05 mol. I and 0.42% $(CO_2H)_2$. $PhCH:CHCO_2H$ after 5 mins. gives 0.47 mol. BzH, 0.20 mol. I and 0.33 mol. $(CO_2H)_2$; $PhCH(OH)$-$CH(OH)CO_2H$, after 10 min., gives 0.43 mol. BzH, 0.18 mol. I and 0.25 mol. $(CO_2H)_2$, so that these are not intermediate products in the oxidation of $PhCH_2CH_2CO_2H$. $PhCH_2CH_2CH_2CO_2H$, after 15 min., gives 0.3 mol. I and 0.13 mol. II; $BzCH_2CH_2CO_2H$, after 20 min., gives 0.44 mol. I. $Ph(CH_2)_4CO_2H$ gives after 30 min. 0.3 mol. I and 0.20 mol. $(CO_2H)_2$; $Bz(CH_2)_3CO_2H$ gives after 25 min. 0.22 mol. I and 0.29 mol. $(CO_2H)_2$. *Benzoylpropionic acid hydrazone anhydride,* m. 153° (90% yield); reduction gives *γ-phenylbutyric acid,* b_{13} 170, m. 50° (50% yield). *β-[p-Chlorobenzoyl]propionic acid,* from PhCl, succinic anhydride and $AlCl_3$, m. 131°; *hydrazone anhydride,* m. 178° (90% yield); *p-chlorophenylbutyric acid,* b_{12} 185°, m. 62° (30% yield). *γ-[p-Chlorophenyl]-butyrolactone,* b_{12} 140–50°, b_{15} 210°. $Ph(CH_2)_4CO_2H$ may be obtained by the catalytic reduction of cinnamalacetic acid. Using 5 atoms O, 5 g. $C_6H_{10}O_2$, $C_6H_{12}O_2$, $C_7H_{14}O_2$

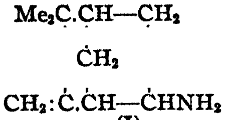
and $C_8H_{16}O_2$ give 3.5, 2.9, 2.5 and 2.0 g., resp., of $(CO_2H)_2$. Suberic acid, after 3–4 hrs., gives 1.1 g. $(CO_2H)_2$; azelaic acid gives 1 g. $(CO_2H)_2$. Me stearate and PhMgBr give 75% of *1,1-diphenyloctadecene*, $Me(CH_2)_{16}CH:CPh_2$, b_{18} 282–3°, m. —1°; oxidation with CrO_3 gives 56% of $C_{17}H_{34}O_2$; the *Ph ester*, b_{11} 240–50° (considerable decompn.), m. 37°; heated 72 hrs. at 328°, 20 g. of the latter give 4 g. PhOH, 2.5 g. $C_{14}H_{30}$, 4.5 g. $C_{17}H_{34}O_2$ and 4 g. of the Ph ester. *Diphenylhexadecene*, b_{13} 265–70°, m. 17–8°; oxidation gives $C_{15}H_{30}O_2$. *1,1-Diphenyl-1,9-octadecadiene*, b_{15} 285–6°; oxidation gives *heptadecenic acid* (III), b_{20} 226–7°, m. —1°. H_2O_2 gives *dihydroxymargaric acid*, m. 94°. Oxidation of III gives pelargonic and suberic acids. Oxidation of diphenylcyclohexylethylene gives cyclohexanecarboxylic acid. *1-Methyl-4-diphenylmethylenecyclohexane*, m. 65°, on oxidation with CrO_3 gives *p*-methylcyclohexanone, m. 162°. C. J. WEST

Rotatory dispersion of certain isomeric butyl esters of *l*-mandelic acid. CHARLES E. WOOD, ALBERT ED. CHRISMAN AND SYDNEY D. NICHOLAS. Univ. of Birmingham. *J. Chem. Soc.* **1928**, 2180–90.—In the isomeric Bu mandelates, the iso-Bu ester shows an increase and the tert. ester a decrease of negative rotation when compared with the *n*-ester. Pronounced decrease in rotation takes place when there are 2 asym. centers of opposite sign in the mol., but without visual anomaly. For visual anomaly the partial rotations of the 2 asym. centers should be of comparable magnitude. All the esters exhibit normal and complex rotatory dispersion. Increase of temp. causes a decrease in rotation of the esters. No max. or min. occur in the temp.-rotation diagrams. Comparison of the rotational data of the 3 esters affords no generalization for relative configurational purposes. Rotational displacements in related series are discussed as a guide to configuration. Bu ester (I), m. 38.5° (cor.), d_4 1.0536, 1.0346, 1.0182, 0.9983 at 39.1, 61.1, 80 and 102.7°; iso-Bu ester (II), m. 35.5°, d_4 1.0536, 1.0337, 1.0173, 0.9977 at 38.5, 61.2, 80.1 and 102.3°; *tert-Bu ester* (III), m. 65°, d_4 1.0682, 1.0520, 1.0325, 1.0146 at 19, 37.5, 59.6, 79.6°; *di-sec-Bu ester* (IV), $b_{0.06}$ 88°; d_4 1.0746, 1.0623, 1.0410, 1.0209, 0.9992 at 3, 18, 43.5, 68.5 and 93°. Values for $[\alpha]^t_\lambda$ gives for I-IV for wave lengths from 6708 to 4359 for temps. corresponding approx. to the densities given. C. J. WEST

Constitution of rottlerin from Indian Kamala. S. DUTT AND D. P. GASWAMI. *J. Indian Chem. Soc.* 5, 21–4(1928); cf. *C. A.* 20, 182.—Nitration of heptaacetylrottlerin with HNO_3 (d 1.52) at the ordinary temp. yields *hexanitroheptaacetylrottlerin*, decompg. or exploding when heated (hexanitrorottlerin, exploding violently at about 200°, described), which, when oxidized with $KMnO_4$ in neutral soln., affords 2,4-dinitrobenzoic, 3,6-dinitrophthalic, and 2,5-dinitroterephthalic acids. Nitration of rottlerin hexa-Me ether under similar conditions leads to the formation of hexanitrorottlerin hexa-Me ether, decomps. on heating, which yields the same oxidation products. Heptaacetylrottlerin, on bromination in AcOH at 170°, affords *hexabromoheptaacetylrottlerin*, decomps. above 300° (*hexabromorottlerin*, unmelted on heating, described), which may be similarly oxidized to 2,4-dibromobenzoic, phthalic and terephthalic acids. The probable constitution of rottlerin is 2,5-[3,2,4,6-$Me(HO)_3C_6HCH_2CO]_2C_6H_3CH(OH)$-CH:CHPh. The substituting nitro groups enter the *o*- and *p*-positions in the styryl side-chain, the 3,6-positions in the central nucleus and the unoccupied positions in the phenolic nuclei. B. C. A.

A new bicyclic, doubly unsaturated hydrocarbon, isocamphodiene, and its hydration product, bornylenol. S. S. NAMETKIN AND ANTONINA ZABRODIN. Univ. Moskau. *Ber.* **61B**, 1491–4(1928).—The simple bicyclic hydrocarbons thus far known belong either to the satd. series (camphane, fenchane) or to the unsatd. series with 1 double bond (camphene, bornylene). The theoretically possible compds. with 2 double bonds are isomeric with C_6H_6 and its homologs and it is probably for this reason that all attempts hitherto made to prep. them have led to the formation only of aromatic compds. If it were possible to introduce the 2nd double bond into the camphene system, the problem would be solved. Because of the great strain to be expected in such a system it was essential to choose a method which would best insure the preservation of the bicyclic system without isomerization to the aromatic system. The method of exhaustive methylation was selected. α-Aminocamphene (I) was converted in the usual way into the quaternary base $C_{10}H_{15}NMe_3OH$ (II) which on cautious distn. yielded, besides the ordinary decompn. products, a cryst. hydrocarbon $C_{10}H_{14}$, unsatd. toward Br and $KMnO_4$ and shown by oxidation with BzO_2H to contain 2 double bonds; it is therefore designated as *isocamphodiene* or *camphenene* (III). The 2 double bonds (one cyclic and the other semicyclic) react with different velocities with AcOH; in the presence of H_2SO_4 is obtained an addn. product (IV), the *acetate* of an unsatd. bicyclic alc. $C_{10}H_{15}OH$, which, assuming that the hydration of III is accompanied by the same rearrangement as

in that of camphene, must correspond in structure to bornylene and is named ***bornylenol*** (V or VI). **III**, m. 41.5-2°, b_{763} 149-50°, similar in appearance, odor and volatility to camphene, reacts energetically with HNO_3, gives a characteristic reaction with H_2SO_4 in alc. (yellow color turning through red to dark red). **IV** (2.2 g. from 2.35 g. **III** with 6 g. AcOH contg. 0.2 g. 50% H_2SO_4 heated 6 hrs. at 55°), b_{18} 106-7°, d^{20} 1.0019, n^{20} 1.4662. **V**, b_{16} 103-4°, m. 60-1°, is very volatile and has an isoborneol-like odor.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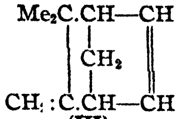
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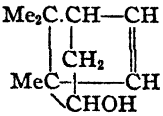
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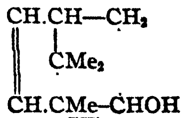

(VI)

C. A. R.

The structure of the products obtained by addition of hydrochloric acid to bornylene. Osman Achmatowicz. *Roczniki Chem.* **8**, 55-70(1928); cf. *C. A.* **21**, 3612.—The HCl addn. yields the same product, $C_{10}H_{17}Cl$ (I), whether carried out in ether, ligroin, $CHCl_3$ or AcOH, in the presence or absence of a little water. It is prepd. preferably by satg. with HCl at 0° 50 g. bornylene in 50 g. $CHCl_3$. In the 1st 7 hrs. 89% of the total HCl is added, in the following 5 hrs. 11%. The crude yellowish crystals, m. 142-4°, have a disagreeable odor, repeatedly recrystd. from low boiling ligroin, m. 149-9.5°, $[\alpha]$ 15.43°, decomp. 190° and sublime easily. Yield 96%. $C_{10}H_{17}Br$ (II) m. 124-5°, $[\alpha]_D$ 6.52°, $C_{10}H_{17}I$ (III) liquid, m. 22-5° after undercooling, $[\alpha]_D$ 55.18°, turns pink in the light. On heating 4 g. I 12.5 hrs. with 100 g. water to 100° in the sealed tube 75% of the Cl is split off. From the water-insol. part a fraction was obtained with a low Cl content, b. up to 160°, which on distn. over Na yielded *cyclene*, m. 64-6°, b. 155-8°. The halogen of I, II and III is split off easily and quant. by $AgNO_3$. Fifty g. II in 450 g. 96% alc. was refluxed 24 hrs. with 50 g. water and 100 g. Zn dust, and the product was distd. with steam and extd. with ether. On redistn. it yielded a fraction, b. 157-65°, m. 141-4° (IV), and one b. 192-9° (V). IV was freed from unsatd. compds. by $KMnO_4$ and yielded *bornylane*. Fractional distn. of V yielded a compd. $C_{12}H_{22}O$, b_{742} 197-8°, mol. refraction 54.90. It is the *Et ether* of the *alc.*, b. 186°. The halogen was therefore in the α-position. This was confirmed by the reaction with AcOAg. A mixt. of 10 g. I, 30 g. AcOAg, 100 g. glacial AcOH and 1 g. water yielded after 4 weeks' standing a small quantity of a subliming *hydrocarbon* and an *ester* b_{14} 105-7°, of pleasant odor, which on sapon. yielded the alc., b. 186°. II reacts in the same manner. An attempt at ascertaining the position of the halogen with the aid of Grignard's reaction failed. The RMgBr obtained from II in large crystals was treated with dry O_2 and yielded on fractional distn. *bornylane*, an *unsatd. hydrocarbon*, m. 196-201° (sepd. by the acetylation of Bertram and Wahlbaum as an *ester*, b_{27} 110-14°, in a too small quantity to be examd.), *borneol*, and a *stereoisomer* of *hydrodicamphene*, b_{20} 195-6°, m. 85-7°, mol. wt. (cryoscopically) 276; 87.29% C, 12.37% H_2. III gave a similar result: a little borneol, much $C_{20}H_{34}$, and a mixt. of low-boiling hydrocarbons. The unsatd. C_xH_y from III yields *i-camphoric acid*, m. 208° (anhydride m. 220-1°), by 3 hrs. shaking of 6 g. with 300 cc. 5% $KMnO_4$ at room temp. It is therefore *bornylene*. At 166° I reacts violently with an equal part of aniline. The fractionated product is treated with 5% $KMnO_4$ at 70-80°. The nonvolatile part contg. neutral and acid substances is too small to be examd. The volatile part consists chiefly of *cyclene* and a small proportion of a *ketone*, the *oxime* of which m. 83-4°. It is probably the *ketocyclene* obtained by Godlewski in 1903. The compds. described are stereoisomers of the borneol series, representing the *endo-borneol* group, while the borneol series represents the *exo-borneol* group (Bredt). *Isoborneol* is a structural isomer of borneol (Wagner) and not a stereoisomer as believed by Bredt. Mary Jacobsen

Aromatic fluorine compounds. II. 4,4'-Difluoro-3-aminodiphenyl and 3,4,4'-trifluorodiphenyl. Günther Schiemann and Einar Bolstad. Techn. Hochschule Hannover. *Ber.* **61B**, 1403-9(1928); cf. *C. A.* **21**, 2668.—$(p\text{-}FC_6H_4)_2$ (I) can be obtained smoothly from $(H_2NC_6H_4)_2$ by the method described in the 1st paper and its prepn. on a large scale and its purification have been so improved that it is now a very readily available substance. For its nitration fuming HNO_3, HNO_3-AcOH, KNO_3 and $EtNO_2$ did not prove satisfactory, but boiling HNO_3 of d. 1.40 readily yielded as chief product (up to 70%) *4,4'-difluoro-3-nitrodiphenyl* (II), the position of the NO_2 group being established by conversion of the II with KOH in boiling MeOH into *4'-fluoro-4-methoxy-3-nitrodiphenyl*, bright yellow, m. 84° (this reaction, which yielded other products also, will be dealt with in a special paper). Attempts to oxidize II to a benzoic acid have not

succeeded, but it is readily reduced by Sn and HCl to the *3-amino compd.* (III). In III, which solidifies at room temp. with extraordinary slowness, the F atoms do not interfere with the formation of dyes. The diazotized III coupled with β-$C_{10}H_7NH_2$ to a brick-red *dye*, probably $H_2NC_{10}H_6N_2C_6H_3FC_6H_4F$, likewise with β-naphthol, and with Schaffer, R and G acids to red-brown, orange-red and crimson *dyes*, resp.; *p*-toluidine and benzidine gave yellow *dyes*. Furthermore III with tetrazotized benzidine gave an orange-red basic *dye*, probably $[FC_6H_4C_6H_2F(NH_2)N_2C_6H_4]_2$. Diazotized III in concd. HCl with HBF_4 gave 94.5% of the light yellow *4,4'-difluorodiphenylyl-3-diazonium borofluoride* (IV) which is so stable that after 1.5 months its N content still agreed satisfactorily with the calcd. value. As it decomps. at the remarkably low temp. of 87.5–8.5°, its dry decompn. offers no difficulties and readily yields up to 85% of the light brown *3,4,4'-trifluorodiphenyl* (V), m. 88.8° (cor.), which is stable although it contains 2 adjacent F atoms on 1 nucleus, but the facts that it was not obtained in pure white form and that it has d_4^{25} 1.43 (detd. by J. Rockstroh) indicate that autodecompn. is not excluded. In the prepn. of I the temp. was kept below −5° during the diazotization which was carried out in such concd. soln. (70 g. benzidine, 220 cc. concd. HCl and 210 cc. aq. $NaNO_2$) that on addn. of the calcd. 225 cc. of 40% HBF_4 a stiff magma was formed; yield of $(C_6H_4N_2BF_4)_2$, decomps. 137–8°, 95%. Thermal decompn. of this yielded more than 80% I (calcd. on the basis of the benzidine used). The pure I, purified better by distn. *in vacuo* than by crystn., b_{11} 115.6°, b_{14} 119°, and can be sublimed without change in the m. p. II, m. 94.6° (cor.). III (yield, 87%), faintly yellow liquid of $PhNH_2$-like odor, b_{13} 159–60°, b_{766} 293°, solidifies on long standing to white needles, m. 27.5° (cor.) (even cooling to −60° does not hasten the crystn.); *Ac deriv.*, m. 96.2°; *Bz deriv.*, m. 122–3°. C. A. R.

The action of gaseous hydrobromic acid on esters of the organic acids at ordinary pressures. Marius Séon. *Compt. rend.* **187**, 131–3(1928).—The decompn. of esters by the simultaneous action of heat and alkalies with the production of the corresponding alc. and acid is a very general and remarkable property of these substances. Expts. have been conducted to ascertain whether gaseous HBr at ordinary pressure would have a similar effect. Boiling HCO_2Am with HBr gas for 6 hrs. gives AmBr and HCO_2H to the extent of 14%. Boiling *o*-$HOC_6H_4CO_2Am$ and HBr for 5 hrs. gives PhOH, CO_2 and AmBr in 8% yield. The phenol is derived from $HOC_6H_4CO_2H$ formed as an intermediate product. With $AcOCH_2Ph$ in the cold and HBr gas for 12 hrs., AcOH and $PhCH_2Br$ are formed to the extent of 100%. $BzOCH_2Ph$ in the cold and HBr gas for 4 hrs. give $PhCH_2Br$ and BzOH in 100% yield. The following reaction occurs in the cold with HBr for 15 hrs.: $2AcOCH_2CH{\cdot}CH_2 + 4HBr \longrightarrow 2AcOH + CH_2BrCH_2CH_2Br$ (27%) + $MeCHBrCH_2Br$ (7.3%). From $AcCH_2CO_2Et$ in the cold and HBr for 2 hrs. EtBr, Me_2CO (47.3% yield) and a condensation product, distg. about 265° and partly freezing at 47°, which with alc. KOH gave Et 2,4-dimethylpyrone-3-carboxylate and the corresponding acid. Ph esters, *e. g.*, PhOBz and PhOAc resisted attack. Boiling cyclohexyl acetate with HBr for 8 hrs. gives AcOH and $C_6H_{11}Br$ (27% yield). Hence the general reaction can be written $RCOR' + HBr = RCO_2H + R'Br$ where R may be any univalent radical and R' another univalent radical either aliphatic, aromatic or cyclohexyl. Phenol functions differently. S. L. B. Etherton

Hylotropic-isomeric forms. IV. Karl Schaum. Univ. Giessen. *Ann.* **462**, 194–209(1928); cf. *C. A.* 10, 2691. S. classifies cases of polymorphism as follows: (1) Phys.; here identical units form different space-lattices; small differences in the mol. anistropy disappear on destroying the space-lattice, *i. e.*, the liquid obtained by just melting either form is the same. (2) Cryptochem., subdivided into metameric (2*a*) and polymeric (2*b*); the fused mass obtained from the 2 forms shows slight differences in 2*a* and 2*b*; 2*a* arises with complex mols. of fairly stable forms caused by intramol. change, while 2*b* is found with substances which tend to associate. High rates of interconversion are found in cases of 2*b*. (3) Chemical, which consists of 2 kinds. The first is further divided into metameric (3*a*) and polymorphic (3*b*). Under 3*a* are cases where the 2 forms in the fused state are quite different, there being in these cases 2 distinct chem. isomers, convertible into each other; in the *b* case, the fusions and interconversion are as in *a*. The 2nd form, giving very low interconversion velocities, is a limiting case of the 1st, each form contg. a mere trace of the unit corresponding with the 2nd form. A no. of substances have been investigated with a view to their classification on the above lines. Ph_2CO, α-form, m. 48°; β-form, m. 23°; m. p. dependent upon previous history of sample; very high rate of interconversion (*RI*). *p*-MeC_6H_4COPh, α-form, m. 55°, β-form, m. 52°; *RI* low. In both cases, the formation of the metastable form is aided by the prolonged heating at high temps. Fresh fusions of the different forms show great differences as regards supercooling and crystn., as well as small differences in phys.

properties. Probably 2*b*, possibly 3*b* in addn. Benzoin, *RI* low. $(BzCH_2)_2CO$, α-form, m. 60°, β-form, m. 110°; *RI*, moderate; case of 3*a*. Me mesityl oxide oxalate, *RI*, moderate; case of 3II*a*. Benzil-*o*-carboxylic acid, α-form, m. 130°, β-form, m. 143.5°; case of 3I*a* or 3II*a*, with transition temp. about 66°; *RI*, low. Betol, α-form, m. 95.5°, β-form, m. 93.5°; *RI* given. 3-Nitro-p-acetotoluide, β-form, m. 93.5°; α-form, m. 95°; *RI*, small; case of 3I*a*. 4,2-$H_2N(O_2N)C_6H_3Me$, β-form, m. 69.5°, α-form, m. 77 0°; the stability of the β-form is increased by heating; *RI* measured. 2,6-$(O_2N)_2C_6H_3Me$, β-form, m. 65.5°; γ-form, m. 48°; transition temp., 40.5°; heating has no effect upon this temp. *m*-$O_2NC_6H_4CO_2H$, *RI* moderate. 4,2,6-$Cl(O_2N)_2C_6H_2OH$ gives a metastable form below −3°. 1-$C_{10}H_7NO_2$ gives a metastable and a stable form at ordinary temps., rapidly passing into the latter. 4-Nitrotriphenylurea has a very low *RI*. Ph_3CH has a high *RI*. The following are given for the transition and m. ps. of the β-forms: CBr_4, 46.7°, 94 3°; succinic anhydride, 110.1°, 120.2°; orcinol, 53.3, 107.5°; *asym*-$Cl_4C_6HNH_2$, 117.8°, 118.1°; Et azoxybenzoate, 112.6°, 119.2°. Other less definite cases are discussed. C. J. West

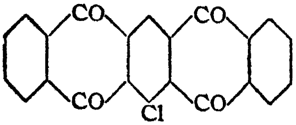
Synthesis of ketophenols by Hoesch's method. A. Korczynski and A. Nowakowski. *Roczniki Chem.* **8**, 254-62(1928); *Bull. soc. chim.* [iv] **43**, 329–37; cf. *C. A.* **21**, 1256; Houben and Fischer, *C. A.* **22**, 237.—The condensations were carried out by satg. the ether solns. at room temp. with HCl in the presence of 0.5-1 g. $ZnCl_2$, which increases the yields. The product was kept on ice 2 hrs.—2 weeks until crystn. occurred. Ph_2O and anisole do not condense with nitriles, even with strongly negative substituents. Only addn. products were obtained. *$(C_6H_5)_2O.CH_3CN.2HCl$*, m. 124–6° (decompn), was obtained from 4.1 g. MeCN and 17 g. Ph_2O in 40 cc. ether at 0–5°. It is hygroscopic, insol. in ether and petroleum ether, sol. in alc., AcOH, $CHCl_3$ and cold water with decompn. Yield 1.2 g. without $ZnCl_2$, 2 8 g. with 0.5 g. $ZnCl_2$. *$C_6H_5OCH_3.CH_3CN.$-$2HCl$*, m. 104-12°. Yield 34%. Anisole and *p*-BrC_6H_4CN do not react. MeCN, PhCN or *p*-ClC_6H_4CN do not react with pyrocatechol, hydroquinone or their mono -or di-Me ethers. *4'-Nitro-2,4-dihydroxybenzophenone imide-HCl* is prepd. from 2.9 g. *p*-$NO_2C_6H_4CN$ and 2.2 g. resorcinol in 120 cc. ether, and soln. of the yellow crystals in 15 cc. 10% HCl at 50°. It is sol. in alc., $CHCl_3$, and cold glacial AcOH, and repptd. by ether. When boiled 15 min. with 30 parts water or a short time with alc. it yields *4'-nitro-2,4-dihydroxybenzophenone*, m. 200°, easily sol. in alc. and AcOH, less sol. in $CHCl_3$, ether and hot water. The aq. soln. gives a reddish brown color with $FeCl_3$, the KOH soln. is dark red. *4'-Bromo-2,4-dihydroxybenzophenone imide-HCl* from 4.5 g. nitrile and 3 g. resorcinol in 40 cc. ether, light yellow, yields on 2 min. boiling with little alc. and pptn. with water 50% *4'-bromo-2,4-dihydroxybenzophenone*, faintly yellow, faint violet color with $FeCl_3$ and a deep orange with KOH. (M. p. not given in original abstr.) 4'-Nitro-2,4,6-trihydroxybenzophenone is prepd. by boiling the product from 2.9 g. nitrile and 3.2 g. phloroglucinol in 120 cc. ether 10 min. with 30 cc. water, dark yellow, m. 244–5°, easily sol. in AcOH, acetone and alc., less sol. in acetone and ether. Yield 46%. It is colored azure by $FeCl_3$, dark red by KOH. *4'-Cl-2,4,5-trihydroxybenzophenone* is obtained by boiling the dark violet oil from 2.7 g. nitrile, 2.5 g. 1,2,4-$C_6H_3(OH)_3$ in 40 cc. ether 0.5 hrs. with 30 cc. water, light orange needles, from aq. alc., m. 260°, easily sol. in alc., scarcely sol. in AcOH. It is colored dark orange by $FeCl_3$, yellow by KOH. Yield 55%. The ether decanted from the condensation product yielded after the addn. of 15 cc. concd. HCl *p*-*$ClC_6H_4CONH_2$*. *4'-Cl-2,3,4-trihydroxybenzophenone* is prepd. by boiling the red oily condensation product 10 min. with little water in a CO_2 current and shaking out with ether. Yield 25%. Faintly yellow needles from dil. alc., m. 157 8°, easily sol. in org. solvents, sparingly sol. in cold water. *2,3'4,4',5-Pentahydroxybenzophenone* is prepd. by condensation of 4.7 g. 1,2,4-$C_6H_3(OAc)_2CN$ with 5 g. 1,2,4-$C_6H_3(OH)_3$, in 8 cc. ether, heating 10 min. on the water bath with 40 cc. 10% H_2SO_4 and refluxing the canary-yellow salt with 20 parts water. Yield 1.2 g. Yellow, m. 242°, sol. in org. solvents, slightly sol. in water. The KOH soln. is blood-red, the alc. soln. is colored green by $FeCl_3$. *4'-OH-2,3',4,6-tetramethoxybenzophenone imide* is prepd. by boiling the condensation product of 2.9 g. vanillonitrile and 3.3 g. $C_6H_3(OMe)_3$ 20 min. with 30 cc. water, addn. of a few drops NH_3, soln. in KOH, and neutralization with dil. HCl. It yields with 5 parts 5*N* HCl the *HCl salt*, sparingly sol. in cold water and easily hydrolyzed. The *H_2SO_4 salt* is formed by a few min. heating with a 15% H_2SO_4, yellow, easily sol. in cold alc., slightly sol. in water. It is hydrolyzed by hot water to *4'-OH-2,3',4,6-tetramethoxybenzophenone* (0.92 g.), small, wart-like aggregates from 80% AcOH, m. 242°. The dil. KOH soln. is light yellow. The warm alc. soln. is colored reddish brown by $FeCl_3$. *2',6'-Dimethoxy-2,4,6-trihydroxybenzophenone* is prepd. by boiling the product from 32 g. nitrile and 2.5 g. phloroglucinol 2 hrs. with 20 cc. water. Yield 0.42 g. Faintly yellow plates from

dil. alc., m. 216–8°, easily sol. in alc., benzene, AcOH, less sol. in ether and $CHCl_3$. The KOH soln. is yellow, the alc. soln. gives an azure color with $FeCl_3$. MeCN and Ph_2O in AmOH or benzene with $AlCl_3$ failed to condense, although the 1st soln. was heated to 100° and the 2nd to 80°. MARY JACOBSEN

Introduction of the benzyl group into the benzene nucleus with the aid of sulfonic acid esters. ZOLTÁN FÖLDI. *Ber.* **61B**, 1609–16(1928); cf. *C. A.* **21**, 1802.—It was shown in the earlier paper that sulfonic acid esters on heating decomp. into SO_3H acids and a bivalent radical which, under the influence of the SO_3H acid, changes either into an olefin or resinous substances of high mol. wt. Thus, $PhSO_3CH_2Ph$ (I) gives PhCH= which, depending on the conditions, condenses to phenylated cycloparaffins or an amorphous polymer. In the hope of arresting this condensation at a lower stage F. attempted to effect the decompn. of the I in solvents. With C_6H_6 he obtained, instead of the expected product, Ph_2CH_2 in good yield. He then tried representatives of various classes of compds. (hydrocarbons, phenols, phenol ethers, carboxylic esters and aldehydes); with few exceptions derivs. benzylated in the nucleus resulted. Positive substituents (alkyl, alkoxy, etc.) already present direct the entering $PhCH_2$ group to the *o*- and (chiefly) *p*-position. Di-derivs. are also always formed but in relatively small quantities and it is advisable to use the substance to be benzylated in large excess (2–5 times the wt. of the I). The temp. is kept as low as possible (best around 110–40°, since pure I itself decomps. 125°). The reaction generally goes to completion very rapidly (from a few min. to a few hrs., depending on the substance to be benzylated), and is usually strongly exothermic. From the product, H_2O exts nearly the calcd. quantity of $PhSO_3H$ but the other product of the reaction is not always obtained in good yield because of the formation of polybenzylated derivs. and of cycloparaffins. F. believes that the PhCH radical first adds to the C_6H_6 nucleus with intermediate formation of a bicyclic cyclopropane, $\left.\begin{array}{l} CH{:}CH.CH \\ | \qquad\quad | \\ CH{\cdot}CH.CH \end{array}\right\rangle CHPh$. To test this view, he treated I with various olefinic compds. (crotonic, tiglic, cinnamic acids, $PhCH{:}CHCO_2Et$), but although an exothermic reaction followed, the only product, besides $PhSO_3H$, which could be isolated was a highly polymerized, amorphous benzylidene deriv.; only with PhCH:-$CHCO_2Et$ was there obtained α-benzylcinnamic acid (II), which may have resulted from the rearrangement of $PhCH.CHPh.CHCO_2Et$ formed primarily. From 50 g. I refluxed in 200 cc. C_6H_6 were obtained 31 g. $PhSO_3H$, 26.8 g. CH_2Ph_2, b. 255–6°, m. 24°, and 4.5 g. of a mixt. of *o*- and *p*-$C_6H_4(CH_2Ph)_2$. PhMe yielded 85% *p*-MeC_6H_4-CH_2Ph (III), b_1 110°, b. 272–4°, and 14% of $MeC_6H_3(CH_2Ph)_2$ (with cold HNO_3 of d. 1.5, III gives *p*-$O_2NC_6H_4[3,4\text{-}Me(O_2N)C_6H_3]CH_2$, m. 142–3°). CH_2Ph_2 (8 g.) with 10 g. I at 110° gives 4.5 g. unchanged Ph_2CH_2 and barely 20% of *o*-$C_6H_4(CH_2Ph)_2$ contaminated with a little of the *o*-isomer. $PhNO_2$ gives only $PhSO_3H$ and a polymerization product; in 1 expt. with com. $PhNO_2$ contg. a little $C_6H_4(NO_2)_2$ was obtained a small quantity of a *benzyldinitrobenzene*, probably 3,5-$(O_2N)_2C_6H_3CH_2Ph$, m. 183–5°. PhOH yielded 25% *p*- and 30% *o-benzylphenol*, b. 303–7°, and 2.7% *benzyl Ph ether*, b. 284–6°. Anisole gave 77% *p-benzylanisole*, b. 288.95°. BzH yielded a light yellow amorphous substance of high mol. wt. From Me salicylate is obtained 56% of *Me 3-benzyl-6-hydroxybenzoate*, odorless and tasteless needles, b_1 134–8°, m. 79.80°; free acid, m. 135–6°, gives a violet-blue color with $FeCl_3$. II (yield, 12.5%), m. 157–8°. C. A. R.

Dibenzoylxylenes and dinaphthanthracenediquinones. IV. HENRI DE DIESBACH AND TONNY JANZEN. Univ. Fribourg (Suisse). *Helv. Chim. Acta* **11**, 724–30(1928).—*1,3-Dimethyl-2-amino-4,6-dibenzoylbenzene* (II), m. 188.5°, is obtained from the corresponding nitro derivative (I) by reduction with Fe dust. It is hardly sol. in boiling H_2O, dil. acids, Et_2O, sol. in C_6H_6, Me_2CO, hot alc. and hot AcOH. *2-Cl compd.* (III), m. 92.5°, obtained by diazotation of II, is sol. in every solvent but H_2O. The *2-Br deriv.*, m. 121–2°, is obtained similarly from II. *1,3-Dicarboxylic-2-chloro-4,5-dibenzoylbenzene* (IV), m. 155–7°, is obtained from III by oxidation in sealed tubes with HNO_3 (d. 1.15) at 170°. The corresponding *Br deriv.*, m. 206°, is obtained in the same way. *6-Chlorodinaphthanthracenediquinone* (V), obtained by heating IV in concd. H_2SO_4, sublimes without melting at about 320°. The corresponding *Br deriv.* is similar. *2,3,2′,3′-Diphthalyl-1,1′-dianthraquinonyl* (VI), obtained by heating V with Cu dust in $PhNO_2$, does not m. 360°, is sol. in concd. H_2SO_4. *Tetra[4′-ketonaphthalino-1′,2′,3′]-8,11,1–9,13,3–10,14,4–7,16,6-pyrene* (VII), obtained by dissolving VI in concd. H_2SO_4, adding Cu dust and heating, is insol. in everything but concd. H_2SO_4. The oxidation of I gives 3,5,2,6-$Bz_2(HO_2C)_2C_6HNO_2$ whose internal condensation in alk. soln. gives *6-nitrodinaphthanthracenediquinone* (IX). The reduction of the NO_2 group in IX with

$Na_2S_2O_4$, gives the *6-amino compd.* (**X**). By diazotation, **X** gives the *6-HO compd.* (**XI**), which sublimes without melting 300°. **XI** treated with $Na_2S_2O_4$ and oxidized with air gives an insol. salt. When the latter is treated with hot H_2SO_4, it gives a product which is assumed to be **XII**.



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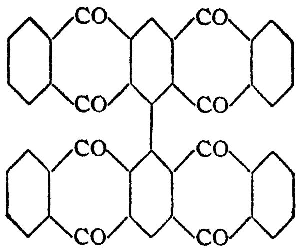

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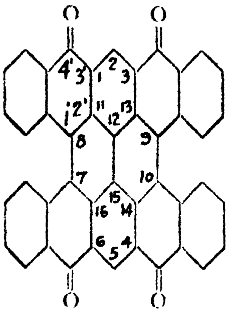

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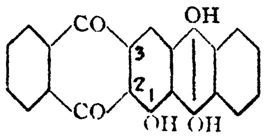


(XII)

A. L. Henne

The "last word" of K. Hoesch (nucleus condensation of phenols, etc., with nitriles, etc.). J. Houben. *Ber.* **61B**, 1597(1928).—Reply to Hoesch (*C. A.* **22**, 1151).

C. A. R.

Constitution of rubrene. Charles Moureu, Charles Dufraisse and Léon Enderlin. *Compt. rend.* **187**, 406–7(1928).—Oxidation of rubrene (I), with CrO_3 gives $o\text{-}C_6H_4(COPh)_2$. The structure of I which best explains the formation of this compd. is that suggested by Willemart (*C. A.* **22**, 4116), $\left[\begin{matrix} CH{:}CH.C{:}CPh \\ | \qquad\quad | \\ CH{:}CH.C{:}CPh \end{matrix}\Big\rangle C= \right]_2$.

D. H. Powers

Action of magnesium organo-derivatives on trisubstituted acetonitriles. (Mme.) P. Ramart-Lucas and F. Salmon-Legagneur. *Bull. soc. chim.* [iv] **43**, 321–9 (1928); cf. *C. A.* **21**, 1626.—The hydrolysis of the ketimine HBr salts obtained by the action of PhMgBr on trisubstituted acetonitriles is most readily effected with NaOAc in AcOH soln. With $PhCH_2CPh_2CN$ in xylene, PhMgBr scarcely reacts, a small quantity of a *substance*, $C_{17}H_{12}O$ (crude), m. 153–4°, being obtained. $PhCH_2MgCl$ (3–5 mols.) affords Ph_2CHCH_2Ph in 70% yield, together with dibenzyl, no ketimine deriv. being produced. Ph_3CCN behaves similarly, and in view of the complete absence of $Ph\text{-}CH_2CN$ or dibenzyl ketone, the fission of the nitriles is represented: $CR_3CN + PhCH_2\text{-}Mg.Cl \longrightarrow CR_3CMgCl + (CH_2Ph)_2 + MgClCN$, the mechanism being attributed to the formation of an unstable complex between the Mg deriv., ether, and ketone in which several atoms are linked by "semivalencies" (cf. Perrin, *C. A.* **21**, 3774). Such complexes may yield on dissocn. the original products or fresh mols. The ketimine HBr salt of Me_2CHCPh_2COPh, m. 250° (decompn.).

B. C. A.

Absorption spectra of some phthaleins and sulfonephthaleins of phenol and *o*-cresol. R. C. Gibbs and C. V. Shapiro. *J. Am. Chem. Soc.* **50**, 2798–810(1928).—The absorption spectra of phenoltetrachloro-, *o*-cresol- and *o*-cresoltetrachlorophthaleins are discussed in their relation to that of phenolphthalein. Evidence is presented to support the view that the absorption of Ph_3CH derivs. is due primarily to the joint effect of the 3 Ph nuclei and not to the central methane C atom. The absorption spectra of phenolsulfonephthalein and *o*-cresolsulfonephthalein in neutral, aq., EtOH and H_2SO_4 solns. indicate that they possess the inner salt structure in EtOH but the quinoid hydrate in aq. solns. The absorption spectra of these sulfonephthaleins in weakly alk. solns. bring out the progress of hydrolysis of the dibasic salts at low concns. The implications of this fact with respect to their use as indicators are pointed out. In concd. alk. solns., both phenolsulfonephthalein and *o*-cresol-sulfonephthalein are converted largely into the colorless tribasic salts of the carbinolcarboxylic acid, although the reaction proceeds very much more rapidly with the former.

C. J. West

Tetraphenylethylene oxide (α-benzopinacol). JEANNE LÉVY AND ROGER LAGRAVE. *Bull. soc. chim.* [iv] **43**, 437–41(1928).—The reactivity of arylated ethylenic hydrocarbons toward BzO_2H depends partly on the mol. wt. and partly on the sym. or unsym. nature of the mol. Hydrocarbons such as stilbene, which possess a sym. mol. are less easily oxidized than unsym. triarylhydrocarbons (cf. *C. A.* **20,** 1610; Böeseken, *C. A.* **21,** 2877; Lévy and Lagrave, *C. A.* **21,** 3360). Tetraphenylethylene oxide, m. 193–4° in Hg, 198–9° in acid bath, prepd. by oxidation of $(:CPh_2)_2$ with BzO_2H in $CHCl_3$ soln., is identical with α-benzopinacolin. $(:CPh_2)_2$ is best prepd. from β-benzopinacolin, obtained by reduction of Ph_2CO with Zn and excess of AcCl (cf. Paal, *Ber.* **17,** 911–3(1884)), which with 2.25 mols. of EtMgBr affords a theoretical yield of $\alpha,\alpha,\alpha,\beta$-tetraphenylethanol, converted by AcCl into $(.CPh_2)_2$. Yields of oxide up to 43% can be obtained by Thorner and Zincke's process (*Ber.* **11,** 65–71, 1396–9(1878)), but replacement of the HCl by dil. H_2SO_4 leads to benzopinacol. No benzohydrol is isolated in these reactions, but 1–2% of $(:CPh_2)_2$ is formed. B. C. A.

New hydrogenation catalyzers. GUYOT. *Chimie et industrie* **Special No.** 410 (April 1928).—According to Fr. pat. 559,787, crude C_8H_{10} can be hydrogenated to C_8H_{14} at 300° by unpurified H_2 at a pressure of 100 atm. in presence of Na as catalyzer, provided both the C_8H_{10} and H_2 are dry. A very slow but distinct production of C_8H_{14} was obtained in the lab at 250° and 15 kg. per sq. cm. The characteristic property of Na as a catalyzer lies in the fact that it is unaffected by the usual catalyzer poisons, and should also be found in all catalyzers which, like Na, are liquid at the hydrogenating temp., provided there is vigorous agitation or provided an inert material offering a large contact surface, *e g*, MgO or infusorial earth, is present. G found that, though the catalytic activity of K is extremely small as compared with that of Na, the Na-K alloys, and particularly NaK and NaK_2, are exceptionally active at the temps. and pressures generally used for hydrogenation in presence of Ni. In the lab 1 kg of C_8H_{10} can easily be converted quantitatively into C_8H_{14} in presence of 2% MgO and 10% of alloy in a "Catalytic" hydrogenizer in 3 hrs. NaK and NaK_2 can be economically and almost quantitatively prepd. by fusing Na at 250–360° with an equiv. amt. of KOH.

A. PAPINEAU-COUTURE

Purification of naphthalene for hydrogenation purposes. GUYOT. *Chimie et industrie* **Special No.** 408–9(April 1928).—Com $C_{10}H_8$ is unaffected by treatment with small quantities of *chlorosulfoacetyl chloride* $(HSO_3CHClCOCl)$, but the S compds. which it contains as impurities, and which rapidly poison catalyzers used in its hydrogenation, are acted upon in such a manner that they can be completely removed by washing with H_2O and then distg. (details are given in Fr pat. 602,408). The new reagent is obtained by the action of 100% H_2SO_4 on CCl_2 CHCl at 90°, $CHCl:CCl_2 + H_2SO_4 = HSO_3CHClCOCl + HCl$. Attempts to isolate it sufficiently pure for analytical purposes were unsuccessful; but its constitution is definitely established by the following reaction: (1) It dissolves almost instantly in H_2O with formation of practically equiv. proportions of HCl and of $HSO_3CHClCO_2H$ which was identified by its Ba salt; (2) On heating in vacuum to a moderate temp with an org acid it gives the corresponding chloride: $HSO_3CHClCOCl + RCO_2H = HSO_3CHClCO_2H + ROCl$, *e. g*, with $ClCH_2$-CO_2H it gives a large (but not quant) yield of $ClCH_2COCl$ together with a small quantity of $(ClCH_2CO)_2O$. In this reaction org acids can be replaced by their esters, *e g.*, with $(CO_2Et)_2$ there is obtained EtO_2CCOCl. In the reaction of H_2SO_4 and $CCl_2 \cdot CHCl$, in addn. to the main product, there is obtained some H_2SO_4 and $ClCH_2CO_2H$, produced by a secondary reaction (decompn. of the chloride by H_2O). In Fr. pat. 503,158 the action of H_2SO_4 on $CCl_2:CHCl$ is used for the prepn. of $ClCH_2CO_2H$, and in Swed. pat. 82,192 for the prepn. of $ClCH_2COCl$; but in both cases the primary reaction seems to have been missed. A. PAPINEAU-COUTURE

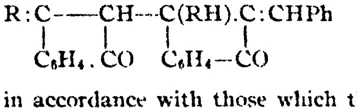
Amino alcohols of the naphthalene series. E. FOURNEAU, TRÉFOUEL, J. AND TRÉFOUEL, MME. J. *Bull. soc. chim.* [iv] **43,** 454–8(1928).—A no. of amino-alcs. of mol. wt. approaching that of quinine and of amino-alcs. of the benzene series contg. a MeO group or a piperidine ring have been prepd. The following are described: *α-dimethylamino-γ-1-naphthyl-*, b_{28} 216–7° (*HCl salt*, m. 134°), *α-diethylamino-γ-1-naphthyl-*, b_{19} 214° (*HCl salt*, m. 138°); *α-diamylamino-γ-1-naphthyl-*, b_{22} 240° (*HCl salt*, m. 114°); and *α-piperidino-γ-1-naphthylisopropyl alc.*, b_{10} 228° (*HCl salt*, m. 145°). The foregoing compds. were all obtained from *α-chloro-γ-1-naphthylisopropyl alc.*, b_{25} 210° (from α-$C_{10}H_7MgBr$ and epichlorohydrin), or from *γ-1-naphthyl-α,β-propylene oxide*, b_{15} 186°, obtained by the action of NaOH on the chlorohydrin in alc. *γ-4-Methoxy-1-naphthyl-α,β-propylene oxide*, b_{25} 225°, *α-chloro-γ-4-methoxy-1-naphthyl-*, $b_{0.2}$ 180°, and *α-piperidino-γ-4-methoxy-1-naphthylisopropyl alc.*, $b_{0.1}$ 200° (*HCl salt*, m. 193–4°), are similarly prepd. *1-Bromo-4-methoxynaphthalene*, b_{15} 178°, is obtained by brominat-

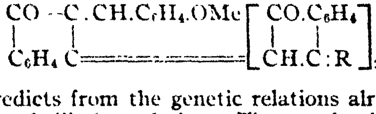
ing α-$C_{10}H_7OMe$ in AcOH. *γ-Chloro-α-phenylisopropyl alc.*, b_{20} 135–55°, *γ-phenyl-α,β-propylene oxide*, b_{39} 113°, *α-piperidino-γ-phenylisopropyl alc.*, b_{12} 172° (*HCl salt*, m. 178–9°); *γ-chloro-α-p-methoxyphenylisopropyl alc.*, b_{24} 188–90°, *γ-p-methoxyphenyl-α,β-propylene oxide*, b. 145–50°, and *α-piperidino-γ-p-methoxyphenylisopropyl alc.*, b_{18} 213° (*HCl salt*, m. 164°), are described. α-Naphthol condensed with epichlorohydrin in presence of NaOH affords *γ-1-naphthoxy-α,β-propylene oxide*, b_{16} 194°, from which *α-piperidino-γ-1-naphthoxy-*, $b_{0.2}$ 196° (*HCl salt*, m. 177–8°), and *α-diethylamino-γ-1-naphthoxyisopropyl alc.*, $b_{0.2}$ 176° (*HCl salt*, m. 125°), are obtained. *γ-2-Naphthoxy-α,β-propylene oxide*, b_{16} 200°, *α-piperidino-γ-2-naphthoxyisopropyl alc.*, $b_{0.15}$ 200° (*HCl salt*, m. 172–3°), and *α-diethylamino-γ-2-naphthoxyisopropyl alc*, $b_{0.6}$ 190° (*HCl salt*, m. 162°), are also described. B. C. A.

ar-α-Substituted hydrindenes. Erich Goth. Univ. Freiburg i. Br. *Ber.* **61B,** 1459–60(1928).—In the prepn. of *ar-β*-nitro- and *ar-β*-aminohydrindene large quantities of the α-isomers are also formed. As Borsche and Bodenstein's (*C. A.* **21,** 84) and Lindner and Bruhin's (*C. A.* **21,** 1647) descriptions of the α-NH_2 compd. (I) do not agree, its properties have been studied. It was found to m. —3° (B. and B., 9°; L. and B., - 2°). Ac deriv., m. 126° (B. and B., 40 1°; L. and B., 126–7°). Bz deriv., m. 136° (B. and B., 136°). Diazotization of I gave the α-HO compd., b_{12} 120°, m. 47-51°, described by Moschner as an oil. C. A. R.

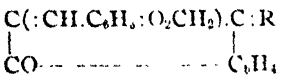
Synthesis of ternary aliphatic arsines with the aid of the Grignard reagent. E. Gryszkiewicz-Trochimowski. *Roczniki Chem.* **8,** 250–3(1928); cf. *C. A.* **21,** 3612.—The following compds. were obtained from RCl, Mg and As_2O_3: *Tri-n-butylarsine*, b_8 102–4°, d^4_{21} 0.9931, n^{21}_α 1.4720, n^{21}_D 1.4752, n^{21}_β 1.4833, n^{21}_γ 1.4901. Yield 70%. *Tri-n-amylarsine*, b_{10} 146–9°, $d^4_{18.5}$ 0.9799, $n^{18.5}_\alpha$ 1.4736, $n^{18.5}_D$ 1.4767, $n^{18.5}_\beta$ 1.4844. Yield 80%. *Tri-n-hexylarsine*, b_{6-7} 169°, $d^4_{22.5}$ 0.9600, $n^{22.5}_\alpha$ 1.4726, $n^{22.5}_D$ 1.4751, $n^{22.5}_\beta$ 1.4825, $n^{22.5}_\gamma$ 1.4888. Yield 60%. *Tri-n-heptylarsine*, of pleasant odor, b_9 197–9°, d^4_{17} 0.9568, n^{17}_α 1.4746, n^{17}_D 1.4775, n^{17}_β 1.4856, n^{17}_γ 1.4908. Yield 65%. *Tri-n-octylarsine*, b_{9-10} 238–40°, d^4_{19} 0.9357, n^{19}_α 1.4721, n^{19}_D 1.4750, n^{19}_β 1.4821. Yield 70%. The odor resembles that of octyl alc. Mary Jacobsen

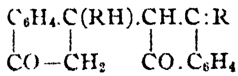
Truxenequinone. Genetic relation between indanedione, diindone, and truxenequinone. II. Mircea V. Ionescu. *Bull. soc. chim.* [iv] **43,** 447–53(1928).—Further investigations have shown that the additive reactions of diindone with carbindogenides, like the substitution reactions in presence of piperidine (cf. *C. A.* **21,** 2666, 3362), are detd. by the nature of the aryl group. Thus di-indone and BzH in pyridine afford *benzylideneindandionylideneindandionediindone* (I; R =C_6H_4<CO CO>C:), yellow, m. 255–6°, while anisaldehyde yields *anisylideneindandionylidenebisdiindone* (II), yellow, m. 242°, and piperonal the true bisindone indigenoid, *piperonylidenediindone* (III), brownish red, m. 267°. These reactions are


(I)

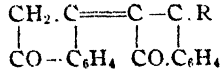

(II)

in accordance with those which theory predicts from the genetic relations already established (*loc. cit.*) between indanedione and diindene derivs. The mechanism previously suggested to explain the formation of truxenequinone from diindone admits of the intermediate stages (IV) and (V) or (VI), derivs. of type (IV) being already known.


(III)


(IV)


(V) (*cis*)


(VI) (*trans.*)

A *trans-deriv.* of type (VI), *trans-anhydrotrisindandione*, m. 332–5°, has now been isolated in about 20% yield, by the action of indandione in benzene on diindene in xylene in presence of piperidine, thus confirming the views previously advanced. B. C. A.

Dimethyl phthalate and other esters of o-phthalic acid. J. A. Handy and L. F. Hoyt. *J. Am. Pharm. Assoc.* **17,** 458–61(1928).—The di-Me ester does not become

turbid in H_2O. It costs more than the di-Et ester, its d. is greater and it is less readily available. The properties of several other esters are tabulated. None of them are as applicable for denaturing purposes as the di-Me or di-Et esters. L. E. WARREN

The importance of the absorption method in the chemistry of the terpenes. ARNO MÜLLER. *Riechstoffind.* **1927,** 98–100; *Chem. Zentr.* 1927, II, 1347.—The measurement of the spectra in the ultra-violet should be used to clear up the constitution and isomerism of the terpenes along with other general methods. Plainly visible changes in the absorption curves are evident with differences in b. p. of 10% *in vacuo.* The usefulness of this method is shown by means of a no. of curves. J. S. REICHERT

Camphor group. IV. Preparation of *p*-ketoborneol. Y. MURAYAMA AND K. OTSUKA. Tokyo Imp. Hyg. Lab. *J. Pharm. Soc. Japan* No. **539,** 24–7(1927).—*p*-Ketoborneol of Bredt and his coworkers (*C. A.* **16,** 250; **18,** 826) was prepd. from bornyl monochloroacetate or trichloroacetate by oxidation with CrO_3 (yield 32%). *p-Ketobornyl monochloroacetate,* m. 85–6°. *Semicarbazone,* m. 228°. *p-Ketobornyl trichloroacetate,* m. 77–9°. *Semicarbazone,* m. 220°. NAO UYEI

Hydrogenation of some acyclic terpenes. S. SABETAY AND J. BLÉGER. Houbigant Lab., Puteaux, Seine. *Bull. soc. chim.* **43,** 839–45(1928).—From 52 g. rhodinol, dissolved in 200 cc. 75% alc. and reduced with H for 1.5 hrs. using Pt as catalyst, was obtained >40 g. dihydrorhodinol (I), rose-like odor, n_D^{15} 1.4370, d_{18} 0.830. *Acetate* (12 g. from 10 g. I and 8 g. Ac_2O), b_{18} 115.5-6°, n_D^{11} 1.4283. Geraniol (b_{12} 113–4°, n_D^{20} 1.4760), reduced as above, gave tetrahydrogeraniol, b_{13} 106.5–7°, n_D^{17} 1.4368. Fifty-five g. citronellal (b_{15} 90–2°, n_D^{18} 1.4475, $[\alpha]_D^{14}$ 11.53°, d_{18}^4 0.855, $[\alpha]_{Hg5461}^{14}$ 14.36°) was dissolved in 200 cc. 75% alc. and 12 g. Pt added in 2 portions. When 1 mol. H had been absorbed, absorption ceased. The product, dihydrocitronellal (II), lemon odor, b_{13} 81.5–2°, n_D^{17} 1.4273, d_{17}^4 0.822, $[\alpha]_D^{12}$ 10.80°, $[\alpha]_{Hg5461}^{12}$ 13.33°. (Cf. *C. A.* **18,** 969.) II oxidized in Me_2CO with $KMnO_4$ gave dihydrocitronellic acid, b_{14} 138–9°, n_D^{19} 1.4338. L. K.

The preparation of ethyl β-furylacrylate from furfural. HENRY GILMAN, R. E. BROWN AND H. L. JONES. Iowa State College. *Iowa State College J. Sci.* **2,** 317–9 (1928).—The yield of Et β-furylacrylate prepd. by the Claisen condensation has been raised from 36.1% to 63.3%. To a 2 l., 3-neck, round-bottom flask contg. 1.25 atoms of powd. Na in a freezing mixt. 4.66 moles of cold abs. EtOAc is added. The mixt. is stirred vigorously until a temp. of −10° is reached, after which 1 mole of furfural is added drop by drop with continued stirring. If rise of temp. and the appearance of a reddish brown color on the particles of Na do not indicate that the reaction has started when 1 cc. of furfural has been added, stirring should be stopped until bubbles rise from the Na. After the addn. of the furfural (about 2 hrs.) stirring is continued for 0.5 hr. in the cold and 1 hr. at room temp. Then, through the separatory funnel, is added 2.1 moles of AcOH followed by 500 cc. of water. The yields corresponding to the indicated temps. are as follows: 0° to 5°, 48.2%-56.4%; −10° to −4°, 60.3%; −15° to −14°, 60.3%-63.3%. Lower temps. increase the yield very little but increase the time required. Substitution of petroleum ether for part of the EtOAc decreases the yield very much. F. E. BROWN

Mononitro- and dinitrothiophenes. V. S. BABASINIAN. Lehigh Univ. *J. Am. Chem. Soc.* **50,** 2748–53(1928).—Detailed directions are given for the nitration of thiophene, using 84 g. thiophene in 340 cc. Ac_2O and 80 g. HNO_3 (d. 1.52) in 600 cc. glacial AcOH, the reaction being carried out at 10°; the yield of the mono-NO_2 compd. is 80%. HNO_3 (d. 1.4) (35 g.) in 55 g. H_2SO_4 (d. 1.82), treated in g.-portions with 20 g. mono-NO_2 deriv., gives 80% of the di-NO_2 deriv., m. 52°. Study of the di-NO_2 deriv. does not confirm the assertion that the ordinarily prepd. compd. is transformed into a higher-melting isomer (cf. Meyer and Stadler, *Ber.* **17,** 2648(1884)). However, the ordinary di-NO_2 deriv. contains a weighable quantity of the isomer, m. 78°. C. J. W.

Action of phenyl magnesium bromide on methyl *o*-cyanobenzoate. 1,3-Diphenyldihydroisoindole. DAVID R. BOYD AND DONALD E. LADHAMS. Univ. College, Southampton. *J. Chem. Soc.* **1928,** 2089–93.—o-$NCC_6H_4CO_2Me$ and PhMgBr give 90% of *1-hydroxy-1,3-diphenylisoindole-HBr,* yellow, decomps. above 220°; the free *base,* m. 192.5° (decompn.); crystn. of the salt from EtOH or heating the base with EtOH-KOH or dil. H_2SO_4 gives quant. o-$C_6H_4Bz_2$. The base in concd. H_2SO_4 gives a magenta-colored soln., thus behaving like a tert. aromatic carbinol. Reduction of the base gives a poor yield of *1,3-diphenyldihydroisoindole,* m. 109°; *HCl salt,* m. 270–80° (decompn.); oxidation gives only $C_6H_4Bz_2$. It behaves like a strong sec. base, yielding a *NO deriv.,* m. 175–5.5°; *Bz deriv.,* m. 236°; *p-toluenesulfonyl deriv.,* m. 255° (decompn.). C. J. WEST

Derivatives of ψ-indoxylspirocyclohexane. RAYMOND L. BETTS AND SYDNEY G. P. PLANT. Dyson Perrins Lab., Oxford. *J. Chem. Soc.* **1928**, 2070-4.—It has recently been shown (*C. A.* **21**, 2882) that ψ-indoxylspirocyclohexane and ψ-indoxylspirocyclopentane, although having many reactions in common, differ in some respects. For this reason certain of the derivs. of the former have been studied. p-$MeC_6H_4NH_2$, cyclohexanone and KCN in AcOH give *1-p-toluidino-1-cyanocyclohexane*, m. 76°; concd. H_2SO_4 at room temp. give the *1-carboxamide*, m. 156°, hydrolyzed by boiling concd. HCl to the *acid*, m. 172°; with KOH at 350-60°, the latter gives *10-methyl-ψ-indoxylspirocyclohexane* (I), m. 164°; *7-Ac deriv.*, m. 144°; 2 g. **I**, 40 cc. H_2O and 10 cc. HNO_3 (d. 1.4) give the *8(?)-NO_2 deriv.*, yellow, m. 158°. *1-o-Toluidino-1-cyanocyclohexane*, m. 72°; the *carboxamide*, m. 143°, and the free *acid*, 117°; *8-methyl-ψ-indoxylspirocyclohexane*, m. 197°; *7-Ac deriv.*, m. 226°; *10(?)-NO_2 deriv.*, pale yellow, m. 273-4°. *1-2′,4′-Dimethylanilino-1-cyanohexane*, m. 115-6°; *1-carboxamide*, m. 133°; free *acid*, m. 125°; *8,10-dimethyl-ψ-indoxylspirocyclohexane*, m. 190°; *7-Ac deriv.*, m. 96°; *NO_2 deriv.*, pale yellow, m. 183-4°. *1-Anilino-1-cyano-4-methylcyclohexane*, m. 107°; *1-carboxamide*, m. 161°; free *acid*, m. 179°; *4-methyl-ψ-indoxylspirocyclohexane*, m. 189°; *7-Ac deriv.*, m. 102°; *10(?)-NO_2 deriv.*, pale yellow, m. 141°. *1-p-Nitroanilino-1-cyanocyclohexane*, pale yellow, m. 134°; the *carboxamide*, yellow, m. 217°; the free *acid*, yellow, m. 201°; reduction with $FeSO_4$ and NH_4OH gives *1-p-aminoanilinocyclohexane-1-carboxylic acid*, m. 216-7°; heating with KOH completely decomps. the acid. Attempts to reduce the NO_2 group in the above compds. have thus far been unsuccessful. C. J. WEST

Some new derivatives of histamine. P. VAN DER MERWE. Univ. Göttingen. *Z. physiol. Chem.* **177**, 301-14(1928).—Histamine derivs. thus far prepd. are much less active physiologically than the parent histamine itself. The alkyl derivs. previously described do not include substitution in position 2 of the imidazole ring. A series of such derivs. has now been prepd., but they appear to have no useful therapeutic properties. The method consists in opening up the histamine mol. by treatment with BzCl and NaOH, whereby $BzNHCH{:}C(NHBz)CH_2CH_2NHBz$ (I) is first formed, and this when heated to 150° with an acid anhydride yields the corresponding 2-alkylhistamine. Thus Ac_2O yields 54% of *2-methylhistamine* (*picrate* m. 237°; *HCl salt* m. 217°); $(EtCO)_2O$ yields 50% of *2-ethylhistamine* (*picrate* m. 219°; *HCl salt* m. 209°); Bz_2O yields 20% of *2-phenylhistamine* (*picrate* m. 230°; *HCl salt* decomps. 240°); and $(PhCH_2CO)_2O$ yields 18% of *2-benzylhistamine* (*picrate* m. 195°; *HCl salt* decomps. 245°). *N-Acetylhistamine*, m. 143°, was obtained in 80% yield from histamine and Ac_2O, and *N-isobutyrylhistamine*, m. 123°, from histamine and $(Me_2CHCO)_2O$. *β-4-Imidazolylethylurea*, m. 148° (*picrate* m. 150°; *oxalate* m. 153°), was prepd. in 50% yield from KOCN and histamine-HCl; *β-4-imidazolylethylphenylurea*, m. 178°, from PhNCO and histamine in Et_2O in nearly quant. yield; and *β-4-imidazolylethyl-α-naphthylurea*, m. 193°, from histamine and α-$C_{10}H_7NCO$. Histamine reacts with $CNNH_2$ at 100° to form *β-4-imidazolylethylguanidine* (*picrate*, m. 245°; *HCl salt*, m. 208°, both with decompn.). Condensation of histamine with p-$MeOC_6H_4CHO$ yields *N-p-methoxybenzalhistamine*, m. 186°; *picrate* m. 222°. Hydrogenation with Na and AmOH converts this into *N-p-methoxybenzylhistamine* (*picrate* m. 213°; *HCl salt*). Treatment with BzCl and NaOH then opens up the ring with formation of *4-p-methoxybenzyl-1,2,4-tris[benzoylamino]butene* m. 205°. Piperonal condenses in the same manner as anisic aldehyde to yield *methylenedioxybenzalhistamine*, m. 180° (*picrate* m. 217°), which may be hydrogenated to the corresponding *benzyl deriv.* (*picrate* m. 195°; *di-HCl salt* m. 245° (decompn.)). *N-ε-Aminoamylhistamine* (*tetrapicrate* m. 215°; *tripicrate* m. 169°) was obtained by condensing ε-chloroamylbenzamide with histamine and removing Bz by sapon. None of these derivs. is of particular interest pharmacologically. A. W. DOX

Phenylene-2,N-aryltriazolylene ketones and phenylene-2,N-phenyltriazolylenemethane (1,2,3-triazole analogs of fluorene and fluorenone). G. CHARRIER. Istituto di Chimica Generale, Pavia and Istituto di Chimica Farmaceutica e Tossicologica, Siena. *Gazz. chim. ital.* **58**, 254-60(1928).—Na phenylene-2-N-phenyltriazolyleneglycolate (cf. *C. A.* **19**, 2205) (10.5 g.) added to $K_2Cr_2O_7$ (22.5 g.) and concd. H_2SO_4 (69 g.) in water (112 g.), let cool, dild. with water, filtered, washed with water, recrystd. twice from EtOH, yields 100% of *phenylene-2-N-phenyl-1,2,3-triazolylene ketone* (I), lemon-yellow, m. 158°. A slight excess of $HONH_3Cl$ and Na_2CO_3 added to alc. **I** and the product recrystd. from EtOH yields the *oxime* of **I**, m. 223°. **I** and $PhHNNH_2$ (1 mol.) boiled 3-4 hrs. in EtOH, cooled, filtered and recrystd. from EtOH, yields 100% of the *phenylhydrazone* of **I**, golden yellow, m. 214°. With p-$ClC_6H_4NHNH_2$ instead of $PhHNNH_2$ and recrystn. of the product from glacial AcOH, there is obtained the *p-chlorophenylhydrazone* of **I**, greenish yellow, m. 226°. Alc. **I** refluxed

with $H_2NHNCONH_2.HCl$ (1 mol.) and Na_2CO_3, the product washed with water and boiling EtOH yields 100% of the *semicarbazone* of I, $C_6H_4.C_2N_3Ph.C{:}NNHCONH_2$, light yellow, m. 309°. I (2 parts) boiled 2 hrs. with red P (1 part) and aq. HI (40 cc. of 57% or of d_{15} 1.70), more HI (40 cc.) added, boiled 3-4 hrs. longer, cooled, poured in water, made alk. with NH_4OH, let settle, filtered, washed with water, the residue dried, extd. with boiling AcOH, filtered, the soln. dild. with water and the ppt. purified and recrystd. several times from EtOH, yields *phenylene-2-N-phenyl-1,2,3-triazolylene-methane* $C_6H_4.C_2N_3Ph.CH_2$. m. 128°, gives slightly fluorescent solns. in org. solvents. *2-N-p-Tolylnaphthotriazolequinone* (which will be described in a forthcoming note) treated with boiling dil. NaOH like the 2-*N*-Ph homolog (cf. *Gazz. chim. ital.* **54,** 984 (1924)) forms *phenylene-2-N-p-tolyltriazolyleneglycolic acid*, $C_6H_4.C_2N_3(C_6H_4Me\text{-}p)C(OH)CO_2H$, m. 194° (decompn.); *Na salt* (II), m. 205° (decompn.). Oxidized with chromic mixt. under the same conditions as those used for the 2-*N*-Ph compd. **II** is transformed into *phenylene-2-N-p-tolyltriazolylene ketone*, golden yellow, m. 196°, with $PhHNNH_2$ it forms a *phenylhydrazone* $C_{16}H_{11}N_3{:}NNHPh$, m. 207°, and with H_2NH-$NCONH_2.HCl$ it forms a *semicarbazone* $C_{16}H_{11}N_3.NNHCONH_2$, light yellow, m. 228° C. C. Davis

Styrylpyrylium salts. X. Anhydropyrylium bases and spiropyrans derived from dibenzyl ketone. Robert Dickinson, Isidor M. Heilbron and Florence O'Brien. Univ. of Liverpool. *J. Chem. Soc.* **1928,** 2077-82; cf. *C. A.* **21,** 3195.—$(PhCH_2)_2CO$ (20 g.) and 11.6 g. o-HOC_6H_4CHO in 30 cc. EtOH with 25 drops of piperidine give 18 g. of *2-hydroxy-α-phenylstyryl benzyl ketone* (I), pale yellow, m. 177°; *semicarbazone*, pale yellow, m. 196°; *Me ether*, pale yellow, m. 140-1°. With HCl in EtOH, cooled in a freezing mixt. while being satd., 5 g. $(PhCH_2)_2CO$ and 2.9 g. o-HOC_6H_4CHO give 5.5 g. *2-benzylidene-3-phenyl-Δ^3-benzopyran*, golden yellow, m. 115°, also obtained by satg. I in EtOH with HCl; it is recovered unchanged after boiling 30 hrs. with excess EtONa. If, during the satn. with HCl, the mixt. is cooled with ice H_2O, there results *3,3'-diphenyldibenzospiropyran*, m. 197°; no color develops when heated in Ph_2O. This compd. also results by satg. I and o-HOC_6H_4CHO in EtOH with HCl. $(PhCH_2)_2CO$ and 2-$HOC_{10}H_6CHO$ in EtOH, with either HCl or piperidine, give *2-benzylidene-3-phenyl-Δ^3-β-naphthapyran*, brilliant reddish orange, m. 145°; on being kept for several days in Me_2CO, the orange color disappears and an amorphous pale yellow solid, m. above 200°, seps. Using 2 mols. $HOC_{10}H_6CHO$, there results *3,3'-diphenyldi-β-naphthaspiropyran*, m. 248°, which forms a *monohydrate*, m. 248°, from Me_2CO. No color develops when heated in Ph_2O C. J. West

Flavanone glucosides. II. Constitution of naringenin. Yasuhiko Asahina and Mototaro Inubuse. Univ. Tokyo. *Ber.* **61B,** 1514-6(1928); cf. *C. A.* **22,** 2946.—Tutin found that eriodictyol, homoeriodictyol and hesperetin on complete methylation yield the same 3,4,2',4',6'-pentamethoxychalcone and, from analogy, assigned a tetrahydrohydroxychalcone structure to naringenin (I). A. and I., however, recently showed that sakuranetin and hesperitin are not chalcones but flavanones, energetic methylation (as well as acetylation) rupturing the hydropyrone ring with formation of chalcone derivs. They have now carried out similar expts. with I and found that with Ac_2O and a drop of concd. H_2SO_4 it gives a *tri-Ac deriv.* (II) which gives no color with $FeCl_3$ but a red color on reduction with Mg and HCl. On long heating with Ac_2O and NaOAc, however, I yields a *tetra-Ac deriv.* (III) which no longer gives a color on reduction. With CH_2N_2 I forms a di-Me ether identical with sakuretin mono-Me ether. I is therefore 5,7,4'-trihydroxyflavanone (cf. Shibata and Nagai, *C. A.* **19,** 3064, who found that the absorption spectrum of I agrees with that of a flavanone and not a chalcone deriv.). Frank's statement that I on catalytic reduction gives phloretin could not be verified. II, m. 53-5°. III, yellowish, m. 133-6°. C. A. R.

Some quinoline derivatives. R. Hupe and A. Schramme. Univ. Göttingen. *Z. physiol. Chem.* **177,** 315-20(1928).—New quinoline derivs. were prepd. for the purpose of testing their pharmacol. activity. *2-Quinolyl-β-ethylamine*, m. 174° (*HCl salt*, m. 212°; *picrate*, m. 209°), was obtained by hydrogenation of *2-quinolylacetaldoxime*, m. 201°, by means of H and Pt. Further reduction of the oxime by Na and EtOH yielded *py-tetrahydro-2-quinolyl-β-ethylamine*, b_{16} 188°; *di-HCl salt* m. 230°. *4-Amino-pyrogallol tri-Me ether* (*HCl salt*, m. 200°) was prepd. by $SnCl_2$ reduction of the corresponding NO_2 deriv., and, by treatment with $ClCH_2COCl$, converted into *4-chloroacetyl-aminopyrogallol tri-Me ether*, m. 85°. By the Skraup synthesis with glycerol and $PhNO_2$ this amine yielded *6,7,8-trimethoxyquinoline* m. 80° (*picrate*, m. 181°). The same

amine when refluxed with $(AcH)_3$ and HCl yielded *6,7,8-trimethoxyquinaldine*, m. 73°; *picrate*, m. 142°; *oxalate*, m. 148°; *chloral addn. product*, m. 114°. Condensation of the amine with $AcCO_2H$ and BzH yielded *trimethoxyatophan*, m. 174–5°. The physiol. properties of these derivs. are not stated. A. W. Dox

Modification of the Skraup synthesis of quinoline. Byron E. Cohn and R. G. Gustavson. Univ. of Denver. *J. Am. Chem. Soc.* **50,** 2709-11(1928).—The violence of the ordinary Skraup reaction is believed to be due to the sudden liberation of CH_2:CHCHO resulting from the action of H_2SO_4 upon $C_3H_5(OH)_3$; AcOH is therefore introduced to remove a large proportion of the $C_3H_5(OH)_3$ from the reaction sphere. The following reagents are placed in a l. flask in the order named: $PhNH_2$ 38 g., $PhNO_2$ 24 g., $C_3H_5(OH)_3$ 100 g., AcOH (80%) 60 cc., H_2SO_4 (95%) 54 cc., and the mixt. heated for 16 hrs.; yield, about 30 g. quinoline. This method eliminates the occasional violence of the ordinary Skraup reaction. The influence of the time of heating and of varying amts. of AcOH and of $C_3H_5(OH)_3$ is shown in curves. The concn. of the AcOH has no decided effect upon the yield of quinoline. C. J. West

Asymmetric nitrogen atom. LV. True autoracemization of optically active ammonium salts. E. Wedekind and G. L. Maiser. Forstl. Hochschule Hann-Münden. *Ber.* **61B,** 1364-75(1928); cf. *C. A.* **22,** 589.—Some yrs. ago E. and O. Wedekind succeeded in sepg. the *d*-bromocamphorsulfonate (I) of *N*-methylallyltetrahydroquinolinium (II) into fractions with different rotatory powers but it is not always possible to obtain optically active iodides (III) from these fractions and the question arose whether this might not be a case of true autoracemization. The expts. have now been repeated on a larger scale to test this point. The results of the resolution expts. were the same as before; mol. rotations of the active cation ranging from 202° to —157° were observed. Recrystn. of the extreme fractions did not increase the rotation but the *l*-salt was now obtained with $[M]_D$ as high as —160° as against a max. of —80.3° in the earlier work. Great caution had to be observed in the conversion of the I into the III by both the older method (pptn. in H_2O with KI) and the new method (treatment with NaI in Me_2CO, a solvent which had been found to have no racemizing action). The highest rotations obtained for the III were $[M]_D$ 28° and —27°; that these values are materially lower than the calcd is readily explained by the observations which were made on the influence of various solvents on the loss in rotation of the active **III.** Of the 5 solvents which could be used (H_2O, MeOH, EtOH, Me_2CO, $CHCl_3$) the 1st three produce a relatively rapid fall in rotation and the last two produce no change Especially noteworthy is the strong influence of H_2O and the slight influence of $CHCl_3$. Kinetic measurements gave for H_2O at 20° a monomol. reaction constant *k* of 0.00543, for EtOH 0.00643, for $CHCl_3$ 0.00131-0.00198; in Me_2CO no change in rotation was observed in 48 hrs. The velocity consts. in H_2O and EtOH show no drift whereas in $CHCl_3$ there is a distinct upward drift, as has been found in the inactivation of all NH_4 salts hitherto studied in $CHCl_3$ and other solvents with low dielec. consts. and which has been explained as due to decompn. through the presence of double moles in $CHCl_3$ The absence of a drift in H_2O and EtOH suggested that the inactivation of the **III** in these solvents does not depend on a reversible decompn but on a true stereochem. rearrangement. From the experience of W. and Paschke, decompn. can always be followed sharply by the change in cond. with time. The cond. of **III** in H_2O and EtOH remains const. whereas in $CHCl_3$ it decreases with the time, the velocity consts. of the decrease being of approx. the same magnitude as the consts. for the decrease in rotation and also showing an upward drift. Even though the decompn. velocity is somewhat less than with the typical asym. NH_4 salts which are inactivated in $CHCl_3$ by thermal dissocn., this might perhaps be considered contradictory to the W. and Paschke rule that quaternary NH_4 halides in $CHCl_3$ and other solvents with low dielec. consts. decomp. when there is present an aryl group together with a benzyl or allyl residue. The **III** contain no free Ph group, to be sure, but on the other hand the C_6H_6 nucleus is present as a component of the tetrahydroquinoline nucleus. If it be conceived that the ring in **III** is opened as shown in the formula

$$\begin{array}{lcl} C_6H_4 & : & CH_2.CH_2 \\ | & & | \\ \multicolumn{3}{l}{NMe(C_3H_5)I.CH_2} \end{array}$$

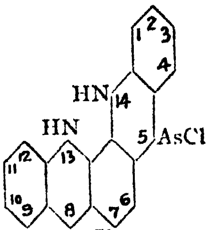
and that two H atoms are added the product will be *propylmethylallylphenylammonium iodide* (**IV**). **IV** was accordingly prepd. Its cond. distinctly decreased with a velocity const. of approx the same magnitude as that of the cond. decrease of **III** and showing the same upward drift, *i. e.*, ring formation in the cyclic NH_4 salts has no influence on the decompn tendency in $CHCl_3$. That the spontaneous decrease in rotation of the **III** in H_2O and EtOH is not due to a decompn. was confirmed in 2 other ways. (1) Alc. solns. of the inactive **III** were allowed to stand until, on the basis of the expts. with the active forms,

all rotation had disappeared and Et_2O was then added as long as a ppt. was formed; the wt. of this ppt. was practically the same as that of the original **III**, whereas if there had been a decompn. it should have weighed less because of the washing away of the decompn. products (tertiary base + alkyl halide). (2) The temp. coeff. (20–30°) of the velocity of decrease in rotation in alc. is 2.06, *i. e.*, materially smaller than the values (3.6–4.1) which had been found for the salts that decomp. The inactivation in H_2O and EtOH can therefore be only a true autoracemization (a stereochem. rearrangement of 1 isomer into its antipode until equil. is reached) analogous to the phenomena observed (in relatively only few cases) in the asym. C atom series. To explain the mechanism of such a process is even more difficult with the N than with the C compds. It is especially difficult to see why active asym. NH_4 salts of the type NabcdX, with individual radicals, show no autoracemization in H_2O and EtOH, whereas **III**, which, with 2 of the N valences in the ring, would be expected to be more stable, does. Of special interest is the fact that true autoracemization is dependent on the presence of ionizable halogen on the N; it has not been possible to obtain a cryst. salt of **II** with other inactive acids (HNO_3, H_2SO_4, $HClO_4$) than the halogen acids, but both the I in H_2O and mixts. of these with solns. of alkali nitrates and sulfates show no change in rotation with time while mixts. with alkali halide solns. do show a distinct decrease (*e. g.*, the velocity const. of this decrease at 25° on the addn. of 1 equiv. KI is 0.00118, is smaller for KBr and still smaller for KCl). **II** offers for the present the only known example of the phenomena described above; it has thus far not been possible to convert *N-ethyl-N-allyltetrahydroquinolinium* (V) through either the camphor- or bromocamphorsulfonate into well crystd. salts suitable for fractionation. The tetrahydroquinoline, m. 243°, was obtained almost quant. from quinoline and H at 200° under 30 atm. with Schroeter's Ni catalyst (the compn. of which is kept secret); the *N*-Me deriv., prepd. with MeI, b. 242–4°, and with CH_2:$CHCH_2I$ in alc. and a little Et_2O gives 80% inactive **III**, light yellow, decomps. 143°, cond. at 25° (concn. 1:250) in H_2O 0.000123, in EtOH 0.000321. *N-Methyl-N-ethyltetrahydroquinolinium iodide*, m. 174°, cond. at 25° in $CHCl_3$ (0.1080 g. in 25 cc.) 0.0003609, remaining const. for 24 hrs. *N*-Ethyltetrahydroquinoline (37 g. from 38.8 g. tetrahydroquinoline with EtI on the H_2O bath), b_{23} 140°, gave in 1 case with CH_2:$CHCH_2I$ in EtOH-Et_2O 2 *iodides* of **V**: the more difficultly sol. form, decomps. 136.0°, mol. wt. in freezing *p*-toluidine 352; and the more easily sol. form, m. 118°, mol. wt. 288–300; in subsequent expts. the 136° form could never again be obtained. C. A. R.

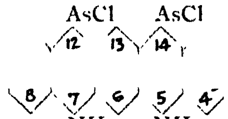
Certain new oxidation reactions of aldehydes. James B. Conant and John G. Aston. Harvard Univ. *J. Am. Chem. Soc.* **50**, 2783–98(1928).—Me_2CHCHO (10 g.) added to 115 g. $K_3Fe(CN)_6$ in 1 l. H_2O at 80° and then treated with 320 cc. *N* NaOH during 45 min., gives 27.5% of *2,2,5,5-tetramethyldihydropyrazine* (I), m. 83–4°, b. 160°; Br-H_2O gives a yellow ppt., $HgCl_2$ a white ppt. Reduction with Na and H_2O gives the piperazine, which gives with HCl and KNO_2 *dinitroso-2,2,5,5-tetramethylpiperazine*, m. 208–10°. In a more concd. soln. (0.28 *M*), there also results *2,2,5,5-tetramethyl-3,6-dicyanopiperazine*, m. 193–4.5°, also prepd. by passing HCN into 1% aq. I at 100°; *di-Na deriv.*, m. 178° (violent decompn.). No Me_2CHCO_2H is formed in this reaction. $MeCOCHMe_2$, under the same conditions, gives hexamethyldihydropyrazine (25% yield); the reaction involves the oxidation of the α-C atom and the gain of N from a fraction of the complex cyanide. At least 65% of the oxidizing agent was reduced to $K_4Fe(CN)_6$. AcH and alk. $K_3Fe(CN)_6$ yield no AcOH at 80°. The oxidation of Me_2CHCHO with $Ce(SO_4)_2$ at 80° in acid soln. yields Me_2CO and $Me_2C(OH)CHO$ as well as Me_2CHCO_2H; the same products are formed in acid soln. by $KMnO_4$ and $Co_2(SO_4)_3$. Chloranil and Pd yield $Me_2C(OH)CHO$. $K_2Cr_2O_7$ in acid soln. at 80° oxidizes Me_2CHCHO in the α-position, yielding Me_2CO to the extent of 40% in very dil. solns. The process of α-oxidation is favored by diln. PrCHO is also oxidized in the α-position, as shown by the formation of CO_2. $KMnO_4$ oxidizes AcH in acid soln. at 80°, yielding CO_2 as well as AcOH if precautions are taken to keep the reactants in very dil. soln. with excess of aldehyde. C. J. West

10-Chloro-5,10-dihydrophenarsazine and its derivatives. VI. Compounds containing two nitrogen and two arsenic atoms in six- and five-ringed systems. Charles S. Gibson and John D. A. Johnson. Univ. of London. *J. Chem. Soc.* **1928**, 2204–15; cf. *C. A.* **22**, 400.—Heating a mixt. of 3.45 g. $(p\text{-}H_2NC_6H_4)_2$, 11.3 g. $o\text{-}BrC_6H_4AsO(OH)_2$, 8.8 g. K_2CO_3, 40 cc. AmOH and a trace of Cu 5 hrs. gives *4,4'-bis(diphenylamine-2'-arsonic acid)*, does not m. 320°; reduction in a hot mixt. of EtOH and HCl contg. a trace of I with SO_2 gives *2,2'-bis-[10-chloro-5,10-dihydrophenarsazine]* (I), pale orange-yellow, which does not m. 325°, apparently identical with the compd. obtained by heating $(p\text{-}PhNHC_6H_4)_2$, $AsCl_3$ and $o\text{-}C_6H_4Cl_2$ for 5 hrs. (58% yield). Oxidation with

H_2O_2 in AcOH gives *2,2'-bis[phenarsazinic acid]*, amorphous; the *di-Na salt* was analyzed; the K, Mg, Ca, Ba, Hg, Ag and Cu salts were also prepd. From the NH_4OH soln. the acid ppts. on boiling. Oxidation with SO_2 in a mixt. of EtOH and HBr gives the *10-Br deriv.* (corresponding to I). *N,N'*-Di-*p*-tolylbenzidine gives 64% of *2,2'-bis[10-chloro-8-methyl-5,10-dihydrophenarsazine]*, orange-red; *10-Br deriv.*, red; *10-I deriv.*, purplish red. Oxidation gives *2,2'-bis[8-methylphenarsazinic acid]*, amorphous, does not m. 325°; *di-Na salt*, needles. *o*-$C_6H_4(NH_2)_2$ and *o*-$BrC_6H_4AsO(OH)_2$ give a crude product which could not be purified, so it was reduced with SO_2 and, as this product could not be purified, it was again oxidized with H_2O_2, purified through the Na salt and again reduced, giving *5,8-dichloro-13,14,5,8-tetrahydroisobenzarsazinephenarsazine* (II), dark brown, insol. in all the usual solvents and does not m. 320°. *m*-$C_6H_4(NH_2)_2$ and *o*-$BrC_6H_4AsO(OH)_2$ give 22% of *1,3-phenylenediaminodi-o-phenylarsonic acid*, distinguished from the corresponding ring acid by its ready soly. in a mixt. of HCl and EtOH; boiling with EtOH-HCl gives *12,14* (or *8,14*)*-dichloro-5,7,12,14* (or *5,13,8,14*)*-tetrahydrobenzarsazinephenarsazine* (III or IV), yellow prisms. *m*-$C_6H_4(NHPh)_2$ and $AsCl_3$ in *o*-$C_6H_4Cl_2$, boiled 5 hrs., give red prisms, which differ from the above, not only in color and cryst. form but in the fact that the former had a more pronounced effect on the mucous membranes than the latter. When these 2 di-Cl compds. were separately oxidized to the diarsonic acids and these acids separately reduced back to di-Cl compds., the latter had the same color (yellow) but different properties. The *5,7,12,14* (or *5,13,8,14*)*-benzarsazinicphenarsazinic acid* prepd. from either di-Cl compd., purified through the *Na salt*, appears to be the same product; various other salts were prepd. Reduction with SO_2 in EtOH-HBr gives the *12,14* (or *8,14*)*-di-Br deriv.*, deep yellow; the *di-I deriv.* is deep red. It was impossible to purify the product from *p*-$C_6H_4(NH_2)_2$. *p*-$C_6H_4(NHPh)_2$ and $AsCl_3$ give 49% of *7,14* (or *13,14*)*-dichloro-5,12,7,14* (or *5,8,13,14*)*-tetrahydrobenzarsazinephenarsazine*, orange-red, doubly refracting, prismatic needles; oxidation with H_2O_2 in AcOH suspension gives *5,12,7,14* (or *5,8,13,14*)*-benzarsazinicphenarsazinic acid*, plates, darkens slightly above 290° but does not m. 320°; *Na salt*. The *di-Br deriv.* forms deep red, doubly refracting, prismatic needles. The di-I deriv. could not be purified.



(II)



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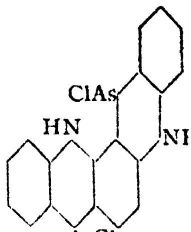
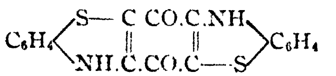


(IV)

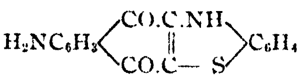
C. J. West

lin-(Benzo-*p*-thiazino)quinones. K. Fries, W. Pense and O. Peeters. Techn. Hochschule Braunschweig. *Ber.* **61B**, 1395–1402(1928); cf. *C. A.* **18**, 2521.—The following addns. are made to the earlier work: As had already been pointed out, the method for the prepn. of vat dyes with the skeleton of *lin*-dibenzo-*p*-thiazine can also be used for the prepn. of those dyes whose simplest representative is the dark blue *lin-di[benzo-p-thiazino]-p-quinone* (I); instead of using an arylaminochloro-α-naphthoquinone, a *N,N'*-diaryl-2,5-diamino-3,6-dichloro-*p*-quinone is treated with an alkali sulfide and the resulting dimercaptan (II), isolated as the di-Me ether (III), is oxidized to the I. Shibata has recently (*C. A.* **22**, 1585) obtained results which agree in most respects with those of K., P. and P. although they do not feel that his proof of the sulfide-like union of the S in the I (addn. of 1 atom O per atom S on oxidation with HNO_3 and regeneration of I from the $Na_2S_2O_4$ vat of the oxidation product) is conclusive; analogous reactions might take place if the I were a disulfide. Decisive evidence as to the nature of the S union in I is obtained by vigorous oxidation, which gives a *disulfone* (IV) and no SO_3H acid. IV has pronounced acid properties, forming a well-crystd. red *di-Na salt*. In agreement with the structure I is the formation of a di-Ac deriv. on acetylation and of a tetra-Ac deriv. on simultaneous reduction and acetylation. A method had already been devised for prepg. derivs. of *lin*-[benzonaphtho-*p*-thiazino]-5,10-quinone contg. an alkyl- or arylamino group in the *peri*-position to the keto-O atom and having a much greater affinity for animal fibers than the parent substance. This method, however,

did not prove to be adapted to the prepn. of the simple NH_2 deriv. **V**, which has now been prepd. from *5-nitro-2,3-dichloro-1,4-naphthoquinone* (**VI**) through the *2-mercapto-3-phenylamino deriv.* (**VII**). The acyl derivs. of **V** are vat dyes giving on wool stronger and faster colors than the free **V**. By treating the **VI** with other arylamines than $PhNH_2$ many derivs. of **V** can be obtained. The **VI** was prepd. by direct nitration of 2,3-dichloro-1,4-naphthoquinone, the chief product being the α-NO_2 compd., as shown by its prepn. from 1,5-$C_{10}H_6(NH_2)NO_2$. 2,5-Dianilino-3,6-di[methylmercapto]-1,4-quinone (**III**), prepd. in the same way as by Shibata, blue-black, m. 260°, gives with H_2O_2 in AcOH 2,5-dianilino-1,4-quinone instead of the disulfone, probably because of hydrolysis of the oxidation product. **I** does not m. 360°, carbonizes on higher heating, is repptd. unchanged by H_2O from the deep blue soln. in concd. H_2SO_4, is not attacked by alkalies even in alc., forms with alk. $Na_2S_2O_4$ a clear golden yellow vat; *di-Ac deriv.*, blue crystals with bronze luster. *Hydroquinone*, pptd. by SO_2 from the vat of **I**, faintly yellow, m. above 360°, rapidly changes back into **I** in the air; *tetra-Ac deriv.*, from **I** in boiling Ac_2O-NaOAc with Zn dust, almost colorless, m. 305°. **IV**, from **I** in concd. H_2SO_4 with H_2O_2, red-brown, m. above 360°, loses its H_2O of crystn. only at 120° *in vacuo*. *2,5-Dichloro-3,6-di[p-methoxyanilino]-1,4-quinone,* from chloranil and *p*-anisidine, red-brown leaflets with greenish black luster, m. 291°. *2',3',5',6'-Di[methoxy-2,3-benzo-p-thiazino]-1',4'-quinone* (**I** with $MeOC_6H_3$ instead of C_6H_4), blue, m. above 360°. *1-Keto-2,2,3,3,4-pentachloro-5-nitrotetralin* (50% from 1,5-$C_{10}H_6(NH_2)NO_2$ in AcOH-HCl with Cl), m. 159° (decompn.), sol. in concd. H_2SO_4 with brown-red color and liberation of HCl, in NaOH with red color (with decompn.), gives in AcOH with aq. $NaHSO_3$ at 80° 90% of *2,3,4-trichloro-5-nitro-1-hydroxynaphthalene*, greenish yellow, m. 208°, which is sol. in alkalies with red color, forms an *Ac deriv.*, m. 150°, and gives in fine suspension in cold AcOH with a little HNO_3 *1-hydroxy-2,3,4-trichloro-4,5-dinitronaphthalene 1,4-dihydride*, m. 85° (decompn.); this cannot be recrystd. without decompn., becomes yellow in the air in a few days, and changes on heating in AcOH, concd. H_2SO_4 and also neutral solvents into **VI**, light yellow, m. 176°, best obtained (40-5%) from the dichloronaphthoquinone in concd. H_2SO_4 with red fuming HNO_3 (d. 1.52) on a gently boiling water bath; **VI** yields with $PhNH_2$ *2-anilino-3-chloro-5(8)-nitro-1,4-naphthoquinone*, brown-red, m. 273°, converted in boiling alc. with aq. Na_2S into the dark violet **VI**, which, boiled 45 min. in $PhNO_2$, treated with $Na_2S_2O_4$ and repptd. with air, yields *9-amino[lin-(benzonaphtho)-p-thiazino]-5,10-quinone* (**V**), blue-black, m. 300°. The light yellow vat of **V** dyes wool brown-violet; the almost neutral golden yellow vat of the *Ac deriv.* (green crystals with black luster, m. 300°) dyes wool a golden green. *2,3-Dichloro-5-amino-1,4-naphthoquinone*, from **VI** with $SnCl_2$-HCl and subsequent treatment of the resulting *hydroquinone-HCl* in H_2O with $FeCl_3$, dark violet, m. 220°, sol. without color in concd. H_2SO_4, repptd. by H_2O, gives with $PhNH_2$ *2-anilino-3-chloro-5(8)-amino-1,4-naphthoquinone*, dark brown, m. 210°, whose vat dyes wool a light red.



(I)



(V)

C. A. R.

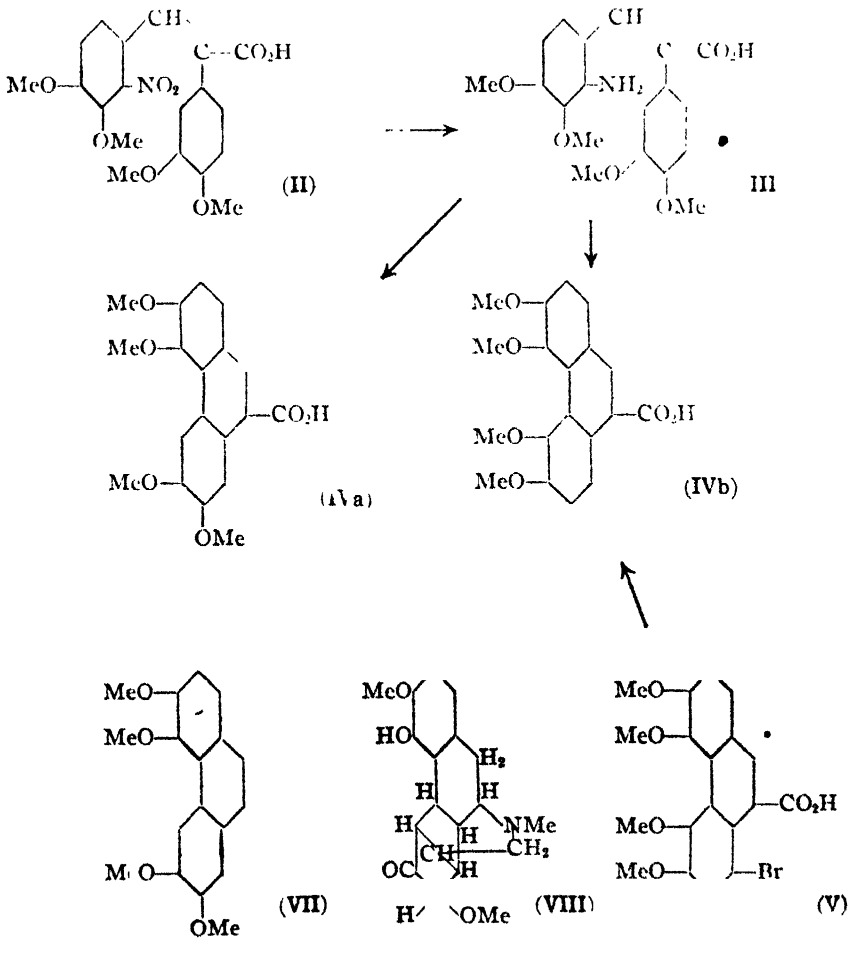
Dihydroxy- and dichloroketohexahydrotriazines. John B. Ekeley and Adrian A. O'Kelly. Univ. of Colorado. *J. Am. Chem. Soc.* **50**, 2731-3(1928).—$H_2NCONHNH_2$.HCl and the $NaHSO_3$ addn. products of $(CHO)_2$, AcCHO and aliphatic 1,2-diketones form dihydroxyketohexahydro-α-triazines, yielding with PCl_5 di-Cl derivs. They do not melt but begin to decomp. at definite temps. They are decompd. on boiling with strong acids but in the cold yield salts; they are stable against hot alkalies The following *$NaHSO_3$ addn. products* were obtained by evapg. aq. solns.: *diacetyl*, decomps. 145-55°; *propionylacetyl*, decomps. 135-50°; *butyrylacetyl*, decomps. 130-40°; *valerylacetyl*, decomps. 100-10°; *caproylacetyl*, decomps. 95-100°. *Dihydroxyketohexahydro-α-triazine*, $C_3H_7N_3O_3$, decomps. 265-70° (the following temps. are all decompn. temps.)(*di-Cl deriv.*, 265-70°); *Me deriv.*, 250-5° (*di-Cl deriv.*, 260-70°); *di-Me deriv.*, 240-5° (*di-Cl deriv.*, 250-60°); *MeEt deriv.*, 230-5° (*di-Cl deriv.*, 240-5°); *MePr deriv.*, 240-5° (*di-Cl deriv.*, 230-5°); *MeBu deriv.*, 230-5°; *MeAm deriv.*, 100-5°.

C. J. West

Synthetical experiments on the aporphine alkaloids. IV. A synthesis of morphothebaine dimethyl ether. John M. Gulland and Robert D. Haworth. Univ. of Durham. *J. Chem. Soc.* **1928**, 2083-8; cf. *C. A.* **22**, 3665.—2,3,4-$O_2N(MeO)_2C_6H_2CH_2COCl$ and 3-$MeOC_6H_4CH_2CH_2NH_2$ in C_6H_6 give *2'-nitro-3',4'-dimethoxyphenylaceto-*

β-3-methoxyphenylethylamide, m. 107–8°; with PCl_5 in $CHCl_3$ for 36 hrs. at room temp. this gives *2′-nitro-6,3′,4′-trimethoxy-1-benzyl-3,4-dihydroxyisoquinoline* (I), pale yellow, m. 121–3°; *HCl salt*, m. 217–8°; *sulfate*, m. 237° (decompn.); *methiodide* (II), yellow, m. 220° (decompn.); this is unusually stable to alk. fission and attempts to decomp. it with NaOH gave only *2′-nitro-6,3′,4′-trimethoxy-1-benzylidene-2-methyltetrahydroisoquinoline*, red tablets or yellow prisms, m. 108–9°, which gives with NaI **II**. The acid mother liquor from **I**, rendered alk. with NH_3, gives *2′-nitro-6,3′,4′-trimethoxy-1-benzoyl-3,4-dihydroisoquinoline*, faintly yellow, m. 164° (decompn.); *oxime*, amorphous. Reduction of **II** with HCl and Zn gives *2′-amino-6,3′,4′-trimethoxy-1-benzyl-2-methyltetrahydroisoquinoline*, pale yellow oil, analyzed as the *di-HCl salt*, which crysts. with 1 mol. $CHCl_3$, m. 155°; the diazo soln. with β-$C_{10}H_7OH$ gives a scarlet dye, giving a reddish purple color with concd. H_2SO_4. Reduction of the diazo soln. in H_2SO_4-MeOH gives *dl-3,4,6-trimethoxyaporphine*, pale yellow oil, whose *HI salt* m. 227° (decompn.). The base is resolved by *d*-tartaric acid and the *l*-base is identical with the natural product; the *methiodide*, m. 195°, $[\alpha]_D$ −87.1° (c 0.448, H_2O). The *d*-base gives a *H l-* (H2O, c 0.821); the oily *d*-base has $[\alpha]_D$ 174.2° ($CHCl_3$). C. J. West

Alkaloids of sinomenium and cocculus. XI. Constitution of sinomenine. 4. H. Kondo and E. Ochiai. Tokyo Imp Univ. *J. Pharm. Soc Japan* No. **539**, 17–24 (1927).—The constitution of sinomenine (I) was tentatively proposed in the last paper (*J. Pharm. Soc. Japan* No. **538**), but the position of the second MeO group still remained



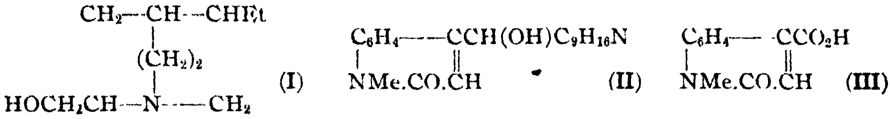
(II) III (IVa) (IVb) (VII) (VIII) (V)

uncertain. By the following syntheses this point has been clarified. Condensation of *v-o*-nitroveratric aldehyde and homoveratric acid by Ac_2O gave *α-(3,4-dimethoxyphenyl) 2-nitro-3,4-dimethoxycinnamic acid* (II) m. 191–2°. Reduction of II with $FeSO_4$ and NH_4OH gave *α-(3,4-dimethoxyphenyl)-2-amino,-3,4-dimethoxycinnamic acid* (III), m. 146°. Diazotization of III by Pchorr's method resulted in a ring closure and gave 2 forms of *tetramethoxyphenanthrene carboxylic acid*, one form (IVa), needles, m. 210°, and the other (IVb), six-sided platelets, m. 232–4°. In order to ascertain the structure of each, the above synthesis was repeated with 6-bromo-3,4-dimethoxyphenylacetic acid in place of homoveratric acid. The resulting *α-(3,4-dimethoxy-6-bromophenyl)-2-nitro-3,4-dimethoxycinnamic acid* was reduced to the corresponding *amino compd.*, m. 187°. The latter was then converted to *3,4,5,6-tetramethoxy-8-bromophenanthrene-9-carboxylic acid* (V), m. 187–8 (decompn.). Removal of Br from V by boiling with Zn-Cu in EtOH-NaOH gave *3,4,5,6-tetramethoxyphenanthrene-9-carboxylic acid* (VI), m. 234°, which was identical to IVb. Hence IVa should have the structure of *3,4,6,7-tetramethoxyphenanthrene-9-carboxylic acid.* Heating of IVa with glacial AcOH for 20 hrs. at 250–60°, gave *3,4,6,7-tetramethoxyphenanthrene* (VII) m. 124–5°. *Picrate* m. 123–5°. VII was found identical to Goto's (*Jour. Agr. Chem. Japan* [2], **2,** 17) dimethylsinomenol (tetramethoxyphenanthrene) obtained by KOH fusion of sinomenine Me ether. These facts show that the second MeO group is located at position 7 instead of at 5 and I is 7-methoxythebainone (VIII). NAO UYEI

Amine oxides of alkaloids. V. *N*-Oxides of ψ-tropine and of tropacocaine. MAX POLONOVSKI AND MICHEL POLONOVSKI. *Bull. soc. chim.* **43,** 364–7(1928); cf. *C. A.* **22,** 1592.—Tropacocaine, m. 49°, when treated with H_2O_2 in acetone gives a *N-oxide*, $C_{15}H_{19}O_3N$, m. 152–3° (*hydrochloride*, m. 200°), which on reduction with SO_2 or nascent H yields the original base, and on hydrolysis with concd. HCl the *N-oxide* of ψ-tropine, m. 229° [*hydrochloride*, m. 286°; *picrate*, m. 257° (decompn.)]. With Ac_2O the *N*-oxide of tropacocaine yields *O-benzoyl-N-acetylnor-ψ-tropine*, hydrolyzed by *N* alc. KOH to *N-acetylnor-ψ-tropine*, m. 127°, or by 20% H_2SO_4 or concd. KOH to nor-ψ-tropine. The latter is also obtained by hydrolysis of the *diacetylnor-ψ-tropine* formed when the *N*-oxide of ψ-tropine is similarly treated with Ac_2O B. C. A.

Alkaloids of lupines. CLEMENS SCHÖPF, OTTO THOMÄ, ERICH SCHMIDT AND WILLY BRAUN. Univ. of Freiburg i. Br. *Ann.* **465,** 97–147(1928).—*I. Isomeric lupinic esters and lupinans.*—In the oxidation of lupinine to lupinic acid (I) with CrO_3 in H_2SO_4, according to Willstätter and Fourneau (*Ber.* **35,** 1917(1902)), it is necessary to use not more than the calcd. amt. of CrO_3; esterification gives a Me ester, (II), b_{10} 120–2°, $[\alpha]_D^{21}$ —19.4°; other prepns. showed values from 5.8° to —19.4°, without any apparent reason for the variation. II, boiled with 4 parts concd. HCl 3–4 hrs., gives the (−)−I HCl salt (III), m. 275°, $[\alpha]_D^{21}$ —13.1°; the prepns. with lower *l*-rotatory values gave a more easily sol. HCl salt, which could not be crystd. III is changed into a resin by $SOCl_2$; PCl_5 in AcCl does not react with III; but in BzCl, PCl_5 at 100°, followed by esterification, gives 65% of *Me* (+)−*epilupinate* (IV), b_{11} 126°, $[\alpha]_D^{16}$ 54.8° (0.1135 g. in 2.5 cc. MeOH), after purification through the *picrate*, m. 185°, $[\alpha]_D^{17}$ 61.8° (0.1596 g. in 2.5 cc. $CHCl_3$). A sample of II with $[\alpha]_D^{18}$ —3.5° (78.6% of pure II) warmed on the H_2O bath with MeONa 1 hr., gives a mixt. contg. 84.8% of IV. II, heated with MeOH satd. with NH_3 at 150° for 8 hrs., gives a mixt. of IV and *Me* (±)−*epilupinate*, b_{11} 128–30°, whose *picrate*, m. 208°, is optically inactive. III in $CHCl_3$, with NH_3 for about 2 hrs., gives (+)—*epilupinic amide*, sublimes at 11 mm. and 250° and m. 228°, $[\alpha]_D^{18}$ 41.3° (0.1137 g. in 2 cc. MeOH). In another expt., in which the $CHCl_3$ apparently contained $POCl_3$, there resulted the *nitrile*, b_{11} 120°, analyzed as the *HCl salt;* $[\alpha]_D^{20}$ 52.9° (0.1730 g. in 10 cc. $CHCl_3$). Anhydrolupinine (V), prepd. according to W. and F., gives quant. in Et_2O the *picrate*, m. 94°, optically inactive. Of the various oxidation methods tried, only $KMnO_4$ in 2 *N* H_2SO_4 gave a definite product; this is the corresponding *glycol*, $C_{10}H_{19}O_2N$, b_{11} 165–7°. Reduction of V by H with Pd-$CaCO_3$ gives a mixt. of inactive α- and β-lupinane, sepd. by fractional crystn. of the picrates; the α-picrate m. 187°; the *β-picrate*, 163°; some lupinine picrate, m. 163°, is also formed. *II. Possible relations between lupinine and the cinchona alkaloids.*—A consideration of the known properties and behavior of lupinine suggests the formula (I); if this be true, then it corresponds to the 2nd half of the reduced cinchona alkaloids. In an attempt to establish such a relation, *dihydrocinchonine-MeI.HI*, yellow, m. 242–3°, was prepd.; oxidation with $K_3Fe(CN)_6$ gave the *quinolone* (II), $C_{20}H_{26}O_2N_2$, m. 213–4°, whose HCl salt m. 301°; further oxidation of II gives the *compd.* $C_{11}H_9O_3N$ (III), m. 246–7°, and cincholoipone, whose *Me ester* (IV) b_{12} 122–4°. *Dihydrocupreine-HI*, m. 241° (decompn.)

yields a *methiodide*, yellow, m. 245–6°; after removal of the I with AgOAc, oxidation gave **IV** as the only amino acid. *Dihydrodesoxycinchonine*, m 73–4°, by the catalytic reduction of desoxycinchonine or cinchene; *HI salt*, m. 230–1° (decompn.); *picrate*, m. 178–9°; *HI methiodide*, analyzed as the *dipicrate*, m. 170–1°; the free compd. is very unstable and quickly changes into an Et_2O-insol. resin; oxidation gives *N*-methyl-γ-quinoline, whose *picrate* m. 229°. Since an acid corresponding to I could not be obtained



(I) (II) (III)

in this way, an effort was made to split off CO_2 from lupinic acid; heating over a free flame or distn. of the Ca salt did not give the desired result. The reaction of the ester with PhMgBr was then investigated; the 1st product of the reaction is the *compd.* $C_9H_{16}NC(OH)Ph_2$, m. 170 1°, $[\alpha]_D^{21}$ 79.2°, stable towards CrO_3 and $KMnO_4$; HBr salt, m. 205°; the 2nd product is a ketone, $C_9H_{16}NBz$, yellow oil, b_1 126–8°, whose *picrate* m. 185°, $[\alpha]_D^{21}$ 38.5° ($CHCl_3$); a methiodide or oxime could not be prepd. These results indicate that the formula I is very improbable for lupinine; the suggestion is made that it may consist of 2 isoprene residues, as sparteine consists of 3 such residues. *III Sparteine.*—Oxysparteine (I) (Ahrens, *Ber.* **38,** 3268(1905)) is unchanged by excess Ac_2O or by Na and EtOH or AmOH; oxidation with H_2O_2 gives, after 4 months, the *N-oxide*, hygroscopic, m. about 220°, analyzed as the *picrate*, m. 221°; SO_2 reduces it to I. I gives a mixt. of 2 methiodides, from which the α-deriv. (II) is sepd. by $CHCl_3$-AcOEt, m. 243–4°, $[\alpha]_D^{18}$ −22.7°; the mother liquor gives the β-deriv., m. 234°, $[\alpha]_D^{18}$ −47.7°. II, transformed into the quaternary base, treated with Ag_2O in a N atm. and distd. in N, gives 45–55% of *α-des-N-methylsparteine* (III) (purified through the $HgCl_2$ compd., m 270 1°), b_{10} 172.5–3°; the mother liquor from the $HgCl_2$ compd. of III gives an isomeric *base*, $C_{16}H_{28}N_2$, b_{10} 160–1° ($HgCl_2$ compd., m. 182–5° (decompn.); *di-HI salt*, m. 223–5° (decompn.), $[\alpha]_D^{18}$ −37.5°). The 3rd product isolated is the *compd.* $C_{16}H_{30}ON_2$, b_{10} 183 9°, $[\alpha]_D^{19}$ 16.0°; $HgCl_2$ complex, m. 154 6°), does not give a salt with HI. The homogeneity of III was shown by the quant. formation of the di-HI salt, m. 236–7°. Crystn. from EtOH gives a *compd.* $C_{16}H_{28}N_2.3HI$ (IV), m. 206–7°, $[\alpha]_D^{19}$ 19 5°; soln. in H_2O and addn. of NaOH to alk. reaction splits off HI, giving the *compd.* $C_{16}H_{28}N_2.2HI$, m. 182 4°, $[\alpha]_D^{18}$ 41.7°; this does not give an Et_2O-sol. base on addn. of NaOH. From the mother liquor of IV there is isolated the *compd.* $C_{16}H_{28}N_2.HI.H_2O$, m. 206 8° (decompn.), $[\alpha]_D^{18}$ −13 3°. III and MeI give a mixt. of the monomethiodide, m. 239°, crystg. with 1 H_2O, and a *dimethiodide*, m. 266° (decompn.). Catalytic reduction of III gives a *dihydro deriv.*, m. 64°; *di-HI salt*, m. 267–8°. A cryst. methiodide could not be obtained. III and Br in $CHCl_3$ give a *dibromide*, whose *perchlorate* m. 267°. Oxidation of III with $KMnO_4$ (cooling in solid CO_2) gives the *glycol*, $C_{16}H_{30}O_2N_2$, m 200°. C. J. West

The identity of yohimbine and quebrachine. Raymond-Hamet. *Compt. rend.* **187,** 142 5(1928).—The presence of the same alkaloid in plants belonging to different botanical families is exceptional. Hence it is of interest to ascertain, as Fourneau and Page accept, whether yohimbine discovered by Spiegel in the corticle of *Pauingstalia Johimbine* (K. Sche) *Pierre* of the family of Rubicae is identical with quebrachine, first isolated by Hesse from the corticle of the white *Aspidosperma Quebracho* Schletch. of the family of Apocynacae, particularly as serious objections, which are mentioned in the paper, have been raised to this conclusion. Chem. pure quebrachine does not differ at all from pure yohimbine and microanalysis gives practically identical figures: calcd. for $C_{21}H_{26}N_2O_3$, C 71 15, H 7.40%; found for yohimbine 71.28, 7.54; for quebrachine 71.02, 7.46. Yohimbic and quebrachic acids have the same m. p., 259 60°. The rotary power in pyridine is 135.9°, and 136.7°, resp. In pyridine, yohimbine and quebrachine recrystd. from 50% MeOH have the same rotary power of 102.7°. The Et esters solidify at 189–90° and in abs. EtOH the rotary powers are practically identical—54.3° and 53.5°, resp. The rotary power in abs. EtOH is 48.1 for the yohimbate and 47.8 for the quebrachate. Physiologically the lethal doses of the HCl salts for a guinea pig are the same. Finally both possess the property of paralyzing the sympathetic nervous system so that the identity of the 2 substances is established. S. L. B. E.

Problem of the constitution of carotin. L. Zechmeister and L. v. Cholnoky. Univ. Pécs in Ungarn. *Ber.* **61B,** 1534–9(1928).—It was shown recently that carotin

(I) on catalytic hydrogenation in cyclohexane with Pt smoothly takes up 11 mols. H_2 with formation of a colorless compd. $C_{40}H_{78}$ very similar in properties to the higher members of the paraffin series (*C. A.* **22**, 2169). By taking samples of the substance during the hydrogenation and comparing them colorimetrically with the original I it has now been found that at least 2 or possibly 3 of the double bonds take no part in the production of the color of I and are satd. only towards the last, when the others have almost completely disappeared. During the absorption of the first 6-7 mols. H_2 the color intensity decreases proportionately to the quantity of H_2 absorbed, the curve representing the decrease in color intensity plotted against the H_2 absorbed following a straight line which, if prolonged, would cut the axis of abscissae at 8 mols. H_2. It is natural to assume that these color-producing double bonds are conjugated; that I contains many conjugated double bonds is also concluded by Pummerer and Rebmann from their absorption measurements (*C. A.* **22**, 2950). The partially hydrogenated compd. has the same spectrum as I itself, *i. e.*, it consists of a mixt. of the colorless compd. and unchanged I; there are no colored intermediate products. The conclusion that, along with the 8 conjugated olefinic double bonds, there are 3 double bonds of another kind, also agrees with P. and R.'s observations on the behavior of I towards ClI. Like Karrer and Salomon's perhydro-γ-crocetin (*C. A.* **22**, 2949), perhydrocarotin is optically inactive. Mol. wt. detns. on I in freezing C_6H_6 and in camphor gave 492 (av. of 6 detns. ranging from 447 to 516), on perhydrocarotin in freezing C_6H_6 593, 587, 593, thus confirming the Willstätter and Mieg C_{40}-formula. C. A. R.

Addendum to our paper on bromoporphyrin I and tetramethylhematoporphyrin iron salt. HANS FISCHER AND G. HUMMEL. Tech. Hochschule Munich. *Z. physiol. Chem.* **177**, 321(1928); cf. *C. A.* **22**, 1163, 1979.—Bromoporphyrin I is shown to be identical with dibromodeuteroporphyrin ester. A. W. DOX

The bile acids. XXI. MARTIN SCHENCK AND HENRY KIRCHHOF. Univ. Leipzig. *Z. physiol. Chem.* **177**, 280-94(1928).—The blue nitroso derivs. prepd. from bilianic acid dioxime by treatment with HNO_3 and by rearrangement through the action of concd. H_2SO_4, resp. (*C. A.* **22**, 3168), were previously thought to contain a bridged linkage. A double bond is now believed to represent the more probable structure in view of the behavior of these substances toward Zn dust and AcOH. The 1st ($C_{24}H_{33}NO_8$) adds 2H and yields a product which m. 240-2° (decompn.). Heated with HCl this decomps into bilianic acid and NH_2OH, whereas HNO_3 oxidizes it back to the original blue NO deriv. The 2nd NO deriv., ($C_{24}H_{34}N_2O_8$), which differs from the 1st in that an NH group has been inserted between the CH_2 and CO of ring II, undergoes reduction to the isodioxime of bilianic acid (I), and HNO_3 converts it back to the original blue NO deriv. Hydrolysis of I by 20% HCl yields NH_2OH and a bilianic acid monoisoxime, $C_{24}H_{35}NO_8$, which occurs in 2 modifications, m. 200-5° and 260°. Blue NO derivs may also be obtained from the oximes of isobilianic, reductodehydrocholic and dehydrocholic acids, but not from those of desoxybilianic, isodesoxybilianic or dehydrodesoxycholic acids. A. W. DOX

Cholesterol. IV. Different methods of oxidation. E. MONTIGNIE. *Bull. soc. chim.* [iv], **43**, 360-4(1928).—Oxidation of cholesterol in AcOH at 70° with an equal wt. of CrO_3 (cf. Mauthner and Suida, *Monatsh.* **17**, 29-49(1896)) affords a ketone and 2 ill-defined acids; with excess of CrO_3 complete oxidation to CO_2 and water takes place, while with smaller quantities of CrO_3 oxycholestenone, m. 122-3°, is obtained. HIO_3, alone or in presence of KOH, $K_3Fe(CN)_6$, alone or in presence of alkali, and $Na_2S_2O_8$, alone or in presence of $AgNO_3$, are without action on cholesterol. $KClO_3$ and HCl afford a mixt. of chlorinated compds. contg. a ketonic compd., since the product reacts with semicarbazide, giving a semicarbazone, and with PCl_5 in $CHCl_3$, giving an uncrystallizable compd. from which Cl is eliminated on oxidation. In view of these and earlier results (*C. A.* **21**, 2477, 3615; Windaus, *C. A.* **7**, 2566, 3503; **8**, 2385; **9**, 2246) it is concluded that cholesterol contains a ring system composed of hydrogenated benzene rings and that oxidation is unlikely to yield further pos. information as to its constitution. B. C. A

Ultra-violet irradiation of dehydroergosterol. A. WINDAUS AND O. LINSERT. Univ. Göttingen. *Ann.* **465**, 148-66(1928).—Ergosterol (I), when irradiated with ultraviolet light, is changed into a compd. or mixt. of compds. (II) of high antirachitic activity; this change is accompanied by a loss in the capacity to form an insol. ppt. with digitonin, a change in the optical activity from about —100° to 15° in 45 hrs., a change in the ultra-violet absorption spectra and an increase in soly. These changes are not due to a polymerization, since both I and II have the normal mol. wt. Both products contain 1 free HO group (reaction with MeMgI); titration with BzO_2H and catalytic reduction indicate that the no. of double bonds is not changed during the irradiation.

The exact nature of the activated product was not detd because the product could not be readily crystd. Therefore a no. of esters and other derivs. have been irradiated; the best results were obtained with *dehydroergosterol* (III). Reduction of I peroxide with Zn and 10% EtOH-KOH gives an *alc.*, $C_{27}H_{44}O_3$, m. 227° (decompn.), $[\alpha]_D^{21}$ —121.6° distn. at 0.5 mm. and 230° gives III, also obtained by heating I and $(AcO)_2Hg$ in EtOH for 40 min., m. 146°, $[\alpha]_D^{20}$ 149.2°; the air-dry product apparently contains 1 H_2O, that dried at 80° in a high vacuum, between 0.25 and 0.5 mol. H_2O; III is quant. pptd. by digitonin. *Acetate* (IV), m. 146°, $[\alpha]_D^{18}$ 193.4°. *Phenylurethan*, m. 161–2°, $[\alpha]_D^{16}$ 202°. Reduction of IV gave γ-ergostanol (satn. of 4 double bonds); in 1 expt. only 3 were satd., giving α-ergostenol. Irradiation in EtOH with eosin gives 30% of the *peroxide* of III, m. 158°. 1 part III and 1 part eosin in EtOH, exposed to sunlight, give 25% of *dehydroergopinacol*, m. 196° (decompn.). Irradiation of IV with a Hg vapor lamp gives 30–40% of cryst material, which consists of an *acetate*, m. 178°, of an alc., m. 175° (not further investigated), and an *acetate* (V), which on sapon. gives the *alc.*, $C_{27}H_{40}O$, m. 134°, $[\alpha]_D^{20}$ 119.5°, which decomps. on standing a few days; it gives no ppt. with digitonin and is not antirachitic; Ac_2O gives V, m. 126–7°, $[\alpha]_D^{16}$ 87.0°, which takes up 4 mols. H, but the reduction product could not be obtained cryst. C. J. WEST

Photochemical action of Br on maleic and fumaric esters (EGGERT, *et al.*) **3.** Behavior of lignin and lignin chloride in the preparation of pulp by the Cl process (WAENTIG) **23.** Possible chemical utilization of CH_4, (NASH, STANLEY) **21.** Preparation of cyanogen by wet method (NOIR, TCHENG-DATCHANG) **6.** Mechanism of oxidation processes. XIV. Activation of oxygen by iron (WIELAND, FRANKE) **2.** Synthesis of organic substances and of ammonia starting with water gas without employing catalyzers (BRUTZKUS) **2.** Distillation of water-soluble organic substances with steam (VIRTANEN, PULKKI) **2.** Toluoylenol (ROSCH) **2.** Solubility relations of isomeric organic compounds. VIII. Solubility of the aminobenzoic acids in various liquids (LAZZELL, JOHNSTON) **2.** Constitution of cellulose xanthogenate (LIESER) **23.** The wood-alcohol problem. I. The saccharification of cellulose (LEONE, NOERA) **16.** Contributions to the systematic knowledge of indicators. XI. Phenolphthalein and its derivatives (THIEL, DIEHL) **7.** Hydrogenating hydrocarbons (Brit. pat. 284,655) **4.** Gaseous reactions (Fr. pat. 635,619) **13.** Catalytic oxidation (Fr. pat. 635,717) **13.** New binary azeotropes (LECAT) **2.** The role of phosphates in the oxidation of glucose (KAPPANNA) **2.** The mechanism of chemical change. I. Promotion and arrest of the mutarotation of tetraacetylglucose in ethyl acetate solution (LOWRY, OWEN) **2.** Partial oxidation of CH_4 and C_2H_6 in the presence of catalysts (LAVING, SOUKUP) **2.** X-ray investigation of the structure of some naphthalene derivatives (ROBERTSON) **2.** The kinetics of oxidation of organic substances with Br. I. Effect of Br on oxalic acid (JOZEFOWICZ) **2.** Crystalline structure of C_6H_6 (COX) **2.** Researches on catalysis at reduced pressure (GRIGNARD) **2.** The photoöxidation of organic compounds by means of bichromates (PLOTNIKOV) **3.** Studies on catalytic action. XXII. Catalytic action of reduced Cu on unsaturated hydrocarbons (KOMATSU, KURATA) **2.** X-ray investigation of the structure of the C chains in hydrocarbons (C_nH_{2n+2}) (HENGSTENBERG) **2.**

SMITH, STANLEY F.: **Aids to Organic Chemistry.** London: Bailliere. 114 pp. 3s. net.

Metallo-organic compounds. STANDARD DEVELOPMENT COMPANY. Fr. 635,354, May 31, 1927. Alkyl compds. of metals of the second sub-group of the fourth periodic group are made by alloying the metal with an alkali metal, powdering the alloy and heating it to 40–70° with a liquid hydrocarbon in which the alkylating agent is dissolved and sepg. the products. An example of the prepn. of $PbEt_4$ is given.

Catalysts for organic synthesis. E. I. DU PONT DE NEMOURS AND CO. Fr. 635,777, June 10, 1927. Catalysts for the synthesis of org. compds. are made by heating to redness mixts. or compds. contg. sexivalent Cr and one or more of the metals, Zn, Cu, Cd, Mg, Mn, Ag and Fe, to form Cr salts contg. tervalent Cr.

Catalytic producton of organic compounds. I. G. FARBENIND. A.-G. Fr. 635,950, June 14, 1927. Contact masses which contain, apart from Cu, Ag, Au, Zn or their mixts. or alloys, other elements, particularly those of the Fe group or their compds., in small proportions and in the absence of supports which are bad conductors of heat, are used for the prepn. of hydrocarbons and org. O compds. from H and oxides of C. Catalysts contg. Cd or Tl or their compds. or mixts., and one or more metals of the Fe group or

their compds. may also be used. In examples, water gas is passed over a mixt. of oxides of Cu and Co, or over oxides of Cu, Fe and Zr. CO and H are passed over oxides of Cu, Ag and Co and CrO_3. Water gas is passed over a dried ppt. of carbonates of Fe, Cd and Cu, or over ferrocyanides of Cd and Cu.

Catalytic dehydrogenation. MARTIN LUTHER, KURT PIEROH and ERICH KRANEPUHL (to I. G. Farbenind. A.-G.). U. S. 1,684,634, Sept. 18. See Brit. 263,877 (*C. A.* **22,** 92).

Purifying catalytic products or other oxygen-containing organic compounds. OTTO SCHMIDT, KARL SEYDEL and ALBERT FELLER (to I. G Farbenind. A.-G.). U. S. 1,684,640, Sept. 18. Mixts. of alcs., aldehydes, ketones and esters or other O-contg. compds. of a higher order than MeOH such as may be obtained by the catalytic hydrogenation of oxides of C are treated in the vapor phase with H at a temp. of at least 50° (but below the temp. at which decompn. of the org. compds. would begin) in the presence of a hydrogenating catalyst such as a Ni-Cu or Ni-Al catalyst. This treatment serves to improve the color and odor of the material.

Catalytic oxidation of anthracene. ALPHONS O. JAEGER (to Selden Co.). U. S. 1,685,635, Sept. 25. In order to produce anthraquinone, vapors of anthracene-contg. material mixed with an oxidizing gas such as air are caused to react in the presence of a catalyst contg. a zeolite, *e. g.*, zeolitic material contg. combined V.

Transformation of paraffins into olefins and other more condensed hydrocarbons. LE PÉTROLE SYNTHÉTIQUE. Fr 32,570, Nov. 24, 1926 Addn to 610,543 The method of Fr. 610,543 is improved by using a vacuum reaching 40 to 50 cm. of Hg.

Decomposition of hydrocarbons. I. G. FARBENIND. A.-G. Fr. 635,889, June 13, 1927. Olefins or diolefins are prepd. by heating to a high temp hydrocarbons as vapors, with or without other gases, and in the presence of contact substances which contain difficultly reducible metallic oxides or mixts or compds of such oxides among themselves, such as oxides of Ca, Sr, Ba, Mg, Be, Zr, W, Mo, U, or aluminates of Ca or Zn or vanadates, chromates, tungstates of Ca, Zn, or Al In examples, tetrahydrobenzene is passed at a temp of 625° over CaO, whereby butadiene is obtained If the oxide is replaced by the aluminate ethylene and butadiene are produced. β Butylene is passed over Si vanadate, butadiene being formed.

Carbohydrate derivatives. WM. HARRISON. U. S. 1,684,732, Sept 18. Stable or permanent carbohydrate derivs. contg. combined N in the form of an amido or imido group or nitrile group are obtained by oxidation of a mixt of a colloidal carbohydrate compd. or compds. contg. the CSS group (such as viscose or starch xanthogenate) and NH_3 or a deriv. of NH_3 such as methylamine, ethylamine, aniline, urea, toluidine, benzylamine, naphthylamine, aminophenols, ethylenediamine, benzidine, diaminodiphenyl methane or phenylhydrazine (preferably an org deriv. of NH_3 in which at least one H atom is free). As oxidizing agents there may be used dichromates, chlorates, hypochlorites, peroxides, ferricyanides, HNO_2, SO_2, ferric salts, cupric salts and atm air or O with or without oxidizing catalysts or O carriers such as oxides and salts of Cu, Co, Fe, Mn and Ni or electrolytic oxidation may be employed. The compds formed are derivs. of diimido carboxylic disulfide of the general formula $RN{:}\underset{OR'}{\underset{|}{C}}{-}S{-}S{-}\underset{OR'}{\underset{|}{C}}{:}NR$, in which R represents H or the radicle attached to the N atom in the NH_3 deriv employed as a starting material and R′ represents the residue of cellulose, starch or other colloidal carbohydrate. Derivs. from cellulose and NH_3, viscose and aniline and some similar derivs. are described. The reactions may be carried out in alk., neutral or faintly acid mediums but not in a soln of such acidity as would decompose the carbohydrate CSS compds. When the reaction is carried out at an elevated temp such as at the b. p of water in an alk. medium other compds. are formed among which appear to be derivs. of benzothiazole of the general formula $C_6H_4{<}^{S}_{N}{>}C{-}OR'$ in which R′ represents a residue of cellulose, starch or other colloidal carbohydrate. The products are suitable for the manuf. of films, filaments, filling materials and the like. Some of them may be dissolved with caustic alkali and pptd. by neutralizing the alkali. Products which are not sol. in caustic alkali may be dissolved by other solvents such as $ZnCl_2$, H_2SO_4 and ammoniacal Cu-contg. solns. Cf *C. A.* **22,** 164.

Acetylating carbohydrates. EDMUND B. MIDDLETON (to E. I. Du Pont de Nemours & Co.). U. S. 1,685,220, Sept. 25. In producing cellulose acetate or similar products ketene is brought into contact with the carbohydrate suspended in glacial HOAc contg. H_2SO_4 or other suitable liquid medium.

Concentrating lower aliphatic acids. BRITISH CELANESE, LTD. AND W. BADER. Brit. 284,582, July 20, 1926. Esters of lower aliphatic acids such as MeOAc are heated with sapong. agents such as H_2SO_4, H_3PO_4 or $H_4P_2O_7$ in the presence of only approx. the quantity of water theoretically required. The materials may be brought into contact counter-currentwise.

Concentration of lower fatty acids. HENRY DREYFUS. Fr. 635,219, May 30, 1927. Lower fatty acids, particularly AcOH, are extd. from aq. solns. by a mixt. of a solvent for the acid and a hydrocarbon, such as 70 parts of Et_2O and 30 parts of petroleum ether b. about 40°. A counter-current process may be used and the extg. mixt. may be in vapor form.

Halides of aromatic oxamic acids. JOSEF HALLER (to Grasselli Dyestuffs Corp.). U. S. 1,685,698, Sept. 25. An oxalyl halide such as oxalyl chloride is caused to react upon a salt of a primary aromatic amine such as aniline-HCl to produce phenyloxamic acid chloride or other halides of aromatic oxamic acids

Solubilizing higher alcohols. H. TH. BÖHME AKT.-GES. AND HEINRICH BERTSCH. Fr. 635,977, June 14, 1927. See Brit. 272,919 (*C. A.* **22,** 1783).

Esters of vinyl alcohol. CONSORTIUM FÜR ELEKTROCHEMISCHE INDUSTRIE GES. Brit. 285,095, Feb. 12, 1927. In passing a mixt. of C_2H_2 and a carboxylic acid such as HOAc over a heated catalyst (which may be formed with acetate or other salt of Zn or Cd and active C or silica), undesired secondary reactions are suppressed and the life of the catalyst is prolonged by passing the mixt. so quickly that more than half of it is unchanged. After fractionation, the residue is returned for retreatment. Details are given.

Separation of amines. BRITISH DYESTUFFS CORPORATION, LIMITED, REGINALD W. EVERATT AND ERNEST H RODD. Fr. 634,906, May 24, 1927. See Brit. 273,923 (*C. A.* **22,** 1982).

Esters of fatty acids. ERNST VECKER. Fr. 635,452, June 2, 1927. Esters of fatty acids are prepd. by treatment with an alc., *e. g.*, glycerol, in quantity less than the theoretical, and eliminating the excess of fatty acid by physical means such as washing.

Cyclic ketones. I. G. FARBENIND. A.-G. Fr. 636,065, June 16, 1927. Cyclic ketones are prepd. by condensing with an acid condensing agent, dicarboxylic anhydrides such as maleic anhydride with hydrocarbons or their derivs. having the peri position free. Diluent or fusion agents may be added. In examples, naphthalene and maleic anhydride, acenaphthene and maleic anhydride, acenaphthene and succinic anhydride, and naphthalene and succinic anhydride are condensed. Cf. *C. A.* **22,** 1981.

Cyclic ketones of more than nine-membered rings. M. NAEF & CIE. Fr. 32,615, Dec. 9, 1926. See U. S. 1,673,093 (*C. A.* **22,** 2755).

Aromatic hydroxyaldehydes. J. D. RIEDEL A.-G. Brit. 285,451, Feb. 17, 1927. Propenylhydroxybenzenes are oxidized with an excess of $PhNO_2$ in the presence of excess alkali hydroxide. $PhNH_2$ also may be present in the reaction mixt. Isoeugenol yields vanillin; 1-hydroxy-2-ethoxy-4-propenylbenzene yields the next higher homolog of vanillin and isochavibetol yields isovanillin. Compds. such as 2-methoxymethyl ether of 1,2-dihydroxy-4-propenylbenzene yield corresponding aldehydes.

Obtaining volatile alkaloids. GEORG W. F. F. KNOTH. U. S. 1,686,866, Oct. 9. In order to obtain alkaloids which are volatile with water vapor, finely divided plant material contg. the alkaloid is formed into a thin liquid pulp with water and milk of lime or other suitable aq. alk. liquid, and this pulp is introduced at the top of a column app. and treated with a countercurrent of steam.

Mercaptans. HERMANN STAUDINGER AND THADEUS REICHSTEIN (International Nahrungs-Genussmittel A.-G.). Can. 283,765, Oct. 2, 1928. Furylmethyl mercaptan is produced by converting furaldehyde into bis(furylmethyl) disulfide by treating it with NH_4HS, and subjecting the bis(furylmethyl) disulfide without isolating it to the action of a reducing agent.

Amino metal mercapto compounds. WALTER SCHOELLER, ADOLF FELDT, MAX GEHRKE and ERICH BORGWARDT (to Chemische Fabrik auf Actien vorm. E. Schering). U. S. 1,685,341, Sept. 25. Compds. such as the Na salt of 4-acetylamino-2-argentomercaptobenzene-1-carboxylic acid and 4-*m*-aminobenzoylamino-2-auromercaptobenzene-1-carboxylic acid may be used (suitably in the form of their Na salts) in combating spirochaetae and may be formed by reacting on amino metal mercaptobenzenecarboxylic acid compds. with an acylizing agent. The products may be used by subcutaneous or intravenous injection. U. S. 1,685,342 relates to corresponding compds. contg the sulfonic group instead of the carboxylic group and describes the production of the

Na salt of 4-acetylamino-2-argentomercaptobenzene-1-sulfonic acid and the corresponding 2-auromercapto compd.

Guanidine derivatives. HELMUTH MEIS and EDUARD TSCHUNKUR (to I. G. Farbenind. A.-G.). Can. 283,751, Oct. 2, 1928. Disubstituted guanidines are manufd. by treating cyanogen halide with a primary org. base (amine), a deriv. or substitution product thereof, in the presence of a salt of an org. base (an aniline salt, a toluidine salt or the like).

Methylol ureas. G. WALTER. Brit. 284,272, Nov. 28, 1925. Methylol compds. of urea, thiourea and their derivs. are obtained by reaction on urea, thiourea or derivs. with CH_2O or its polymer in an org. solvent such as alc. and preferably in the presence also of a base such as NaOH. Cf. *C. A.* **21,** 3626.

Oxalates. GUY H. BUCHANAN and GEORGE BARSKY (to American Cyanamid Co.). U. S. 1,687,480, Oct. 9. Ca oxalate is treated with an alkali metal carbonate such as Na_2CO_3 in the presence of water at a temp. above 40° (with an excess of 15–35% of the carbonate) to form a soln. of alkali metal oxalate.

Tetrazoles. A. BOEHRINGER (trading as C. H. Boehringer Sohn). Brit. 285,080, Feb. 11, 1927. Tetrazoles are made by treating esters of oximes, suitably the sulfonic esters, or their so-called Beckmann transformation products, with azides or free hydrazoic acid, or by treating the esters, in the presence of hydrazoic acid, with substances such as thionyl chloride and $POCl_3$ or PCl_5 which effect the transformation. Examples are given of the production of 1-benzyl-5-amino-1,2,3,4-tetrazole by esterifying phenylacetamid-oxime with benzenesulfonic acid and heating the product with alc. Na azide, and of 1-phenyl-5-amino-1,2,3,4-tetrazole by esterifying benzamide oxime with benzenesulfonic chloride in NaOH soln. and then boiling with alc. Na azide. Cf. *C. A.* **22,** 3170.

Water-soluble organic stibinous compounds. MORRIS S. KHARASCH (to Eli Lilly & Co.). U. S. 1,684,920, Sept. 18. Compds. are made which have the Sb atom bonded by at least one bond to a C atom of an org. radical (preferably phenyl) and have the Sb bonded by its remaining bond or bonds to a S atom or atoms, each of which S atoms is bonded to a C atom of an org. radical contg. an acid group which has a free valence bond capable of being attached to H or a metal. *p*-Hydroxyphenylstibinous iodide, $HOC_6H_4SbI_2$ (m. 112–115° and made by a method described in detail) when combined with 2 mol proportions of thiosalicylic acid (I) in alc. soln. yields HI and *p*-hydroxyphenylstibinousthiosalicylic acid, insol. in water and ether and somewhat sol. in acetone and abs. alc., having an indefinite m. p. and decompg. when heated and forming salts with Na, K, NH_4, Ca and like metals. *p*-$HOC_6H_4SbCl_2$ (m. 128°), by reaction with 2 mol. proportions of *p*-mercaptobenzenesulfonic acid (II) similarly yields *p*-hydroxyphenylstibinous-*p*-thiobenzenesulfonic acid (a white substance which does not melt or decomp. below 300°), the Na salt of which is also described. *p*-HOC_6H_4-$SbCl_2$, by similar reaction with thioglycolic acid, yields *p*-hydroxyphenylstibinous-thioglycolic acid, which decomps. in melting and forms salts, the Na salt being particularly mentioned. *p*-Acetylaminophenylstibinous chloride-HCl monohydrate and I form *p*-acetylaminophenylstibinousthiosalicylic acid, m. about 200°, and which forms salts such as those of Na, K, NH_4 and Ca. *p*-Acetylaminophenylstibinous chloride-HCl monohydrate and β-mercaptopropionic acid, heated to 50–60° in alc., yield *p*-acetylaminophenylstibinousthiopropionic acid, m. 105–7°, and forming salts with Na and other metals. $C_6H_5SbI_2$ with II yields phenylstibinousthiobenzenesulfonic acid which does not melt or darken below 300°. *p*-Acetylaminophenylstibinous chloride-HCl monohydrate and II produce *p*-acetylaminophenylstibinousthiobenzenesulfonic acid, the Na salt of which is a trypanocide. *p*-Aminophenylstibinous chloride (manuf. of which is described) with II forms the hydrochloride of *p*-aminophenylstibinous-thiobenzenesulfonic acid which forms salts with alkali and alk. earth metals. *p*-Aminophenylstibinous chloride-HCl with I yields *p*-aminophenylstibinousthiosalicylic acid-HCl which begins to decomp. about 110° and forms Na and other salts. In this reaction the chloride or oxide may be also used as starting material instead of the hydrochloride. *m*-Aminophenylstibinous chloride with I yields a product similar to that from the *p*- compd. *p*-Acetylaminophenylstibinous chloride-HCl monohydrate with cysteine-HCl yield a white product which is very hygroscopic. Phenylstibinous iodide, chloride or oxide and I produce phenylstibinousthiosalicylic acid, m. 186°. In general products as described are therapeutically active and have relatively low toxicity.

Oxidation of aldoses. CHEMISCHE FABRIK VORM. SANDOZ. Fr. 635,603, June 7, 1927. Aldoses are transformed into the corresponding monocarboxylic acids by oxidizing the sugar in alk. soln. with a hypochlorite in the presence of small quantities of Br or I compds. Examples are given of the oxidation of glucose, galactose and lactose.

Decolorizing tartaric acid solutions. URBAIN CORPORATION. Fr. 32,633, Apr. 9,

1926. Addn. to 622,649. The process of the parent patent is extended to the treatment of all mother liquids with active C, as a suspension or in the form of an absorption column with or without alkali alginate or colloids.

Perylene. CHARLES H. MARSCHALK. U. S. 1,684,738, Sept. 18. A P ester contg. the β-dinaphthol radical such as the chlorophosphoric ester is heated to effect distn. in the presence of Zn and $ZnCl_2$. Cf. *C. A.* **21,** 3204.

Perylene and its derivatives. I. G. FARBENIND. A.-G. Fr. 635,599, June 7, 1927. See Brit. 272,528 (*C. A.* **22,** 1859).

Acetaldehyde. HUGH S. REID and WALDO C. HOVEY (to Canadian Electro Products Co.). U. S. 1,687,228, Oct. 9. See Can. 270,333 (*C. A.* **21,** 3368).

Acetic acid. I. G. FARBENIND. A.-G. Brit. 284,588, Jan. 29, 1927. EtOAc is employed as a solvent in concg. HOAc solns. by distn. Water and EtOAc distil off at 69–70° and the condensate seps. into 2 layers and the ester is returned to the still. When the temp. rises to 77°, concd. HOAc remains in the still.

Acetic anhydride. WILLIAM P. SKERTCHLY (to Henry Dreyfus). Can 283,817, Oct. 2, 1928. Ac_2O contg. S and S compds. is purified by treatment with NaOAc, or other alkali or earth alkali or other metallic acetate or two or more of such acetates and Cl, the Ac_2O being subsequently distd

Acetic anhydride. I. G. FARBENIND. A.-G. Brit. 285,090, Feb. 11, 1927. Water vapor is removed from a vapor mixt contg. Ac_2O and the latter is simultaneously condensed by adding an inert low-boiling solvent such as C_6H_6, toluene, $CHCl_3$, trichloroethylene or ethylene chloride (or a mixt. of such compds.) to carry away the water vapor, with or without the addn. of a higher-boiling solvent such as *o*-dichlorobenzene, quinoline or quinaldine or a mixt. of these to reduce the vapor tension of the anhydride. A sepg. column and dephlegmator may be used.

Acetic anhydride. CONSORTIUM FÜR ELEKTROCHEM. INDUSTRIE G.m.b.H. Fr. 635,248, May 31, 1927. See Brit. 272,951 (*C. A.* **22,** 1783).

Purifying benzoic acid and its derivatives. ALPHONS O. JAEGER (to Selden Co.). U. S. 1,685,634, Sept 25. In order to sep. benzoic acids from the corresponding phthalic acids, an aq. dispersion of the acids is subjected to continuous leaching with a current of org. solvents for benzoic acid, such as gasoline or C_6H_6, the solvent is sepd. from the water and the benzoic acids and phthalic acids are recovered from the solvent and from the water, resp.

Separating benzoic acids from phthalic acids. ALPHONS O. JAEGER (to Selden Co.). U. S. 1,686,913, Oct. 9. A mixt. contg. benzoic and phthalic acids, such as that obtained by catalytic oxidation of $C_{10}H_8$, etc , is subjected to the action of steam at a temp. not substantially above that at which the phthalic acids are substantially transformed into anhydrides (suitably about 150–175°), and the steam and benzoic acids are permitted to leave the mixt. and the benzoic acids are sepd. from these vapors by fractional condensation.

Maleic acid and maleic anhydride. A. BOEHRINGER (trading as C. H. Boehringer Sohn). Brit. 285,426, Feb. 16, 1927. Maleic acid and anhydride are produced by catalytic oxidation with oxidizing gases of compds. of the furan series such as furan, furfuryl alc., furfural, methylfurfural, hydroxymethylfurfural and pyromucic acid or their mixts. (which may be crude products) or mixts. of furan compds. with aromatic hydrocarbons or substances capable of forming compds. of the furan series such as dehydromucic acid. V or Mo oxides or other usual oxidizing catalysts may be used.

Phthalic anhydride. CHESTER E. ANDREWS (to Selden Co.). U. S. 1,685,624, Sept. 25. A mixt. contg. both phthalic anhydride and $C_{10}H_8$ such as the mixt. resulting from partial oxidation of $C_{10}H_8$ is vaporized into a flowing current of air or purified flue gas or other inert gas while heated to a temp. of about 200° and the resulting gas and vapor mixt. is cooled in successive stages (in an app. which is described, having a series of collection chambers), separately to crystallize the vaporous substances. Other substances may be similarly purified.

Phthalic anhydride. A. O. JAEGER (to Selden Co.). Brit. 285,017, Feb. 8, 1927. Phthalic anhydride obtained by catalytic oxidation of $C_{10}H_8$ vapor is purified by subjecting it to conditions favoring condensation and polymerization of unsatd. components so that substances of much higher b. p. than phthalic anhydride are formed from the impurities and sepn. is then effected by distn. or sublimation. The condensation, etc., may be effected by heating at about the b. p. of phthalic anhydride for several hrs. or by heating at a lower temp. with MnO_2 and Cl. Numerous modifications and details of procedure are also given.

Sulfonic acids. G. S. PETROV. Brit. 284,859, Feb. 1, 1927. Sulfonic acids of high mol. wt. made by sulfonating hydrogenated anthracene, hydrocarbons of the ter-

pene series or turpentine with sulfo-aromatic fatty acids are purified by mixing their solns. in water or aq. alc. with hydrocellulose, wood powder, finely ground sawdust or other porous cellulose material. The mass may be dried at a moderate temp. and extd. with benzine, benzene and alc. used successively. Several examples are given.

Anilinedisulfonic acid. I. G. FARBENIND. A.-G. Brit. 285,488, Feb. 18, 1927. Aniline-2,5-disulfonic acid is made by sulfonating aniline-3-sulfonic acid with oleum until the monosulfonic acid has disappeared and subjecting the resulting mixt. of di- and trisulfonic acids to the action of dil. acids.

2,3-Aminonaphthoic acid. I. G. FARBENIND. A.-G. Brit. 284,998, Feb. 7, 1927. 2,3-Hydroxynaphthoic acid is fused with $ZnCl_2.NH_3$ and NH_3 may be passed over the mass during the reaction. The product is extd. with hot HCl after washing out the $ZnCl_2$ with cold dil. HCl, and the 2,3-aminonaphthoic acid is purified by dissolving with an alkali and pptg. with an acid.

Menthol. RHEINISCHE KAMPFER-FABRIK GES. Brit. 285,394, Feb. 15, 1927. Liquid menthol mixts. are obtained in the hydrogenation of thymol, menthone and isomenthone comprising inactive neomenthol and some inactive menthol. By combined use of a freezing-out and fractional distn. these products are sepd. and the inactive menthol is purified by conversion into esters or ester acids followed by crystn and sapon. Details are given. Cf. *C. A.* **22,** 2573.

Menthol. RHEINISCHE KAMPFER-FABRIK GES. Brit. 285,403, Feb 15, 1927. *dl*-Neomenthol and *dl*-neoisomenthol are transformed, separately or together, into *dl* menthol by catalytic hydrogenation, by heating with mentholates of alkali or alk. earth metals, Mg or Al, or by oxidation with chromic acid or treatment with dehydrogenation catalysts followed by hydrogenation of the resulting *dl*-menthone or *dl*-isomenthone. Various details are given.

Diethylene glycol dinitrate. WM. H. RINKENBACH (one-half to Walter O. Snelling). U. S. 1,686,344, Oct. 2. This compound is made by reaction of diethylene glycol with a mixt. of HNO_3 25%, H_2SO_4 67% and H_2O 8%. It is a liquid of lower viscosity than nitroglycerin and is suitable for use in *explosives*.

Tetranitrodianthrone. BERTHOLD STEIN (to Grasselli Dyestuff Corp.). U. S 1,686,992, Oct. 9. Tetranitrodianthrone, in which the nitro groups are attached in a β-position is made by treating dianthrone with HNO_3 and H_2SO_4 at 0–5°. It forms colorless crystals, difficultly sol. in concd. H_2SO_4 and in most org solvents, and by weak alk agents such as pyridine it is transformed into the isomeric tetranitrodianthranol It may be used for making *dyes* and other compds.

Hexahydroaniline. WILHELM LOMMEL and THEODOR GOOST (to I G. Farbenind. A.-G.). Can. 283,752, Oct 2, 1928. Aniline is heated to 250–300° in the presence of Co as a catalyst and with a H pressure of about 100 atm.

1-Phenyl-2-methylaminopropanol. W. MERCK, K. MERCK, L. MERCK, W. MERCK and F. MERCK (trading as the Firm of E. Merck) Brit. 284,644, Feb 2, 1927. This compd. is prepd. by reaction of methylamine on 1-phenyl-1-keto-2-bromopropane in aq. soln., with or without addn. of benzene or other suitable org. solvent which is not miscible with water below 50°, pptg. the resulting 1-phenyl-1-keto-2-methylaminopropane with gaseous HCl and reducing

1-Phenyl-3,4-trimethylenepyrazolone. CHARLES MANNICH. U. S. 1,685,407, Sept. 25. This compd. forms slightly colored crystals, m 183–4°, is insol. in water but sol. in EtOH, MeOH and caustic alkalies It may be made by treating the reaction product of esters of ketopentamethylenecarbonic acids and phenylhydrazine with alk. condensing agents and is suitable for making *dyes* and *medicinal compds*. Cf. *C. A.* **21,** 3371.

***N*-Hydroxyethyl derivatives of aminophenols.** GUSTAV REDDELIEN AND WERNER MUELLER (to I. G. Farbenind. A.-G.). Can. 283,750, Oct. 2, 1928. *p* Aminophenol is condensed with ethylene oxide in the presence of a catalyst

Vanillin. F. BOEDECKER. Brit. 285,156, Nov. 12, 1926. See Can. 275,947 (*C. A.* **22,** 1597).

Vanillin. F. BOEDECKER. Brit. 285,551, Nov. 16, 1926. See Can. 275,948 (*C. A.* **22,** 1597).

Vanillin and isovanillin. J. D. RIEDEL. Fr. 32,559, Nov. 19, 1926. Addn. to 624,227. Safrole or isosafrole is heated with an alc. alkali to obtain *m*- and *p*-propenylpyrocatechol monomethoxymethyl ethers which are sepd. by fractional crystn. of their Na salts. In an example safrole is heated with MeOH-KOH in an autoclave and the product transformed into the Na salts and the methoxyisoeugenol allowed to crystallize out. The methoxyisochavibetol salt is left in soln. and these derivs. are converted into vanillin and isovanillin in known manner.

11—BIOLOGICAL CHEMISTRY

PAUL E. HOWE

A—GENERAL

FRANK P. UNDERHILL

Rate of liberation of tryptophan from proteins by enzymes. IDA KRAUS-ROGINS. Univ. of Chicago. *Proc. Soc. Exptl. Biol. Med.* **25,** 449–50(1928).—Casein, edestin, Witte peptone and squash seed globulin were subjected to trypsin hydrolysis and free tryptophan was detd. In 1 hr. $^3/_4$ of the total available tryptophan in casein was liberated, a little less than $^1/_2$ was liberated from edestin, and $^1/_6$ from squash seed globulin. Witte peptone had $^1/_3$ of the total tryptophan available before incubation with trypsin and in 1 hr. of incubation $^2/_3$ was available. Equil. was established in 24 hrs. for peptone, 72–96 hrs. for casein, and 120 hrs. for edestin and squash seed globulin. Pepsin and erepsin did not liberate tryptophan from these proteins, and trypsin is the only enzyme involved. The effects of Na and Cl ions on the pptn. of tryptophan by $HgSO_4$ were studied. C. V. B.

Demonstration of rapid pepsin-hydrochloric proteolysis in vitro. WM. H. WELKER. Univ. of Illinois. *Proc. Soc. Exptl. Biol. Med.* **25,** 450–1(1928).—The addn. of a small quantity of solid pepsin to fibrin jelly causes an almost immediate soln. of the fibrin at room temp. The sol. protein products are different from fibrinogen, and they are largely proteose. C. V. B.

Glass surfaces versus paraffin surfaces in blood-clotting phenomena. An hypothesis. ROSS A. GORTNER AND DAVID R. BRIGGS. Univ. of Minnesota. *Proc. Soc. Exptl. Biol. Med.* **25,** 820–1(1928).—Streaming potential measurements showed that a bare glass capillary had a negative electrokinetic potential of 30 millivolts, and if coated with paraffin it has a zero potential against water. The high potential would favor electrostatic adsorption of positively charged colloids at the interface of glass-blood serum, and there would be no such tendency for a paraffin-blood serum interface. It is suggested that the initial step in blood clotting involves a surface concn. of some positively charged constituent, the concn. being brought about by selective adsorption. C. V. B.

Formation of oxygen from carbon dioxide by protein-chlorophyll solutions. M. EISLER AND L. PORTHEIM. *Biochem. Z.* **192,** 132–6(1928).—The authors' original results (*C. A.* **17,** 2717) are maintained in reply to the criticisms of Dolk and van Veen (*C. A.* **21,** 3383). B. C. A.

Further investigations of the oxidative principle (oxone) of the blood and bone-marrow. ALFRED NEUMANN. *Verhandl. deut. Kongresses innere Medizin* **1927,** 370–2; *Chem. Zentr.* **1927,** II, 2686.—By means of HCl-EtOH a fatty substance was obtained from the eosinophilic granule of the blood corpuscles, which after HCl-EtOH extn. leaves a residue giving a benzidine reaction. From the red bone-marrow can be obtained by adsorption by kaolin and extn. with AcOH at various temps. several peroxidatively active fractions, of which one seems to contain a porphyrin-like substance. All the fractions contain Fe. C. C. DAVIS

Influence of the endocrine glands on the catalase of the blood. STEFANO CASTAGNA. Univ. Sassari. *Arch. farmacol. sper.* **45,** 209–14(1928).—White rats after castration showed a diminished catalase activity in the blood. This is attributed to diminished metabolism, especially with regard to oxidative processes and hence less occasion for the decompn. of peroxides. A. W. DOX

Cozymase. XV. HANS VON EULER AND KARL MYRBÄCK. Univ. Stockholm. *Z. physiol. Chem.* **177,** 237–47(1928); cf. *C. A.* **21,** 3910, and following abstract.—Concd. boiled ext. of yeast was dialyzed through collodion and partially purified by treatment with $Pb(OAc)_2$. The filtrate was further purified by pptn. with $Pb(OAc)_2$ and NaOH, the ppt. decompd. by H_2SO_4, the filtrate pptd. by $Hg(NO_3)_2$, the ppt. decompd. by H_2S, the filtrate treated with $AgNO_3$ and the ppt. discarded; the filtrate pptd. by careful addn. of NH_4OH and the ppt. decompd. by H_2S. The last filtrate was pptd. by phosphotungstic acid and 2% H_2SO_4, the ppt. suspended in dil. HCl and extd. with a mixt. of Et_2O and AmOH. Evapn. of the solvent and pptn. by EtOH or MeAc gave a highly active prepn. Picric acid then pptd. a cryst. substance, m. 209°, which was identified as the picrate of *adenylthiomethylpentose*. The filtrate from this, after removal of picric acid, still contains S, probably as the above thio deriv., but the cozymase activity is increased enormously. The most active prepns. gave a phloroglucinol reaction, the intensity of which varied with the cozymase activity.

Such prepns. have no m. p. and have not yet been obtained in cryst. form. At 110° some sublimation occurs, but the sublimate and residue are both inactive. The cozymase prepns. do not reduce alk. Cu soln. until after hydrolysis. The greater part (90%) consists of a substance which contains adenine (identified as the picrate) and a N-free residue of equiv. wt. 350. From the latter some furfural is obtained by acid distn. Mol. wt. of the cozymase prepn. was 486 by actual detn. and 480 by calcn. from the above constituents. Cozymase is thus a sort of nucleoside or nucleotide, or else comprises a very small proportion of the prepn. Assumption of a nucleoside structure is supported by the fact that liver and kidney maceration and a purified nucleosidase prepn. rapidly inactivate cozymase with liberation of reducing sugar, whereas other enzymes such as pepsin and esterase are without effect. Cozymase is remarkably stable to oxidizing agents such as $KMnO_4$ and Br-H_2O. A. W. Dox

New investigations on cozymase. Hans von Euler and Karl Myrbäck. *Chimie et industrie* **Special No.,** 819–20(April, 1928); cf. *C. A.* **21,** 3910, and preceding abstract.—In HNO_3 soln., $AgNO_3$ partially ppts. cozymase; complete pptn. can be obtained from neutral soln. by means of ammoniacal $AgNO_3$ and $Ba(OH)_2$, the resultant product having an activity of 10,000–20,000 units. In acid soln $HgSO_4$ does not ppt. cozymase; but complete pptn. may be obtained with $Hg(NO_3)_2$ if sufficient NaOH is added to make the soln. weakly acid or neutral. Hg is eliminated with H_2S and the activity of the product is similar to that obtained from $AgNO_3$. Phosphotungstic acid ppts. cozymase completely from HCl solns. On shaking the ppt. with 1:1 Et_2O-AmOH in presence of aq. HCl, the phosphotungstic acid is eliminated with practically no loss in activity (contrary to elimination with $Ba(OH)_2$), giving a product with an activity of 60,000–70,000 units. The phosphotungstic salt of cozymase is sol. in 50% Me_2CO, and the purity of the cozymase can be increased by a method of fractional soln. From solns which have been purified by Pb and Ag salts and by phosphotungstic acid, picric acid ppts. large quantities of inactive picrates; the cozymase can be pptd. (sometimes completely) with silicotungstic acid, and the cozymase obtained from this ppt has a variable activity, usually 20,000–30,000 but sometimes 50,000–77,000 units Cozymase gives the characteristic reactions of pentoses with phloroglucinol and HCl and with orcinol, to an extent almost to equal to the nucleoside adenosine; but the latter does not accelerate fermentation by zymase. Purified cozymase does not give the reactions of proteins. Its mol. wt., detd. by the diffusion method, is 485 ± 10. It shows striking similarity in chem. properties with vitamin B and with the H_2O sol. growth factor; but has a lower thermostability than the former A Papineau-Couture

Enzyme chemistry of the processes of acid formation by Aspergillus niger. II. K. Bernhauer and H. Wolf. German Univ. Prague. *Z physiol Chem* **177,** 270–9 (1928); cf. *C. A.* **22,** 3187 —By cultivating the fungus on a substrate contg acid of definite p_H (0.04–0.02 N H_3PO_4, 0.02 N HCl, p_H = 2.8–3.0) its ability to form citric acid can be increased considerably. The more vigorous mycelium development resulting from the use of H_3PO_4 does not explain this phenomenon, since HCl has the same influence on acid production without increasing the fungus growth. The acid appears to have a direct influence on the formation of the enzyme complex. Various strains of *A. niger* differ in respect to their ability to form acid. The triturated mycelium can under suitable conditions produce acid from glucose. The formation of glucuronic and oxalic acids indicates that these processes are of enzymic nature. Citric acid formation under such conditions could not be demonstrated. With further development the method should be useful in furnishing an insight into the processes of acid formation by fungi. A. W. Dox

The linkage relationships of the nucleic acid in yeast. N. Ishiyama. Univ. Berlin. *Z. physiol. Chem.* **177,** 295–7(1928).—The nucleic acid in animal cells (fish sperm, thymus gland, etc.) is accompanied by a basic protein such as protamine or histone. Thus far no basic protein has been found associated with the nucleic acid of plants. By treatment of dried yeast with $CuCl_2$ and Na picrate an attempt was made to sep. a basic protein but without success. Evidently no protamine-like substance is present in yeast. The linkage relationships of yeast nucleic acid must therefore be essentially different from those of thymonucleic acid, but the nature of this linkage remains undetd. A. W. Dox

The peroxidase nature of "active" iron. H. Ucko. Charite, Berlin. *Klin. Wochschr.* **7,** 1515–7(1928).—Baudisch and Welo (cf. *C. A.* **19,** 3198) have claimed that Fe compds. must be classified as active and inactive depending upon their ability to transfer O from peroxides to easily oxidizable substances The methods used in classifying these forms of Fe are not very reliable, however, for Fe forms colored compds. with benzidine, for example, that are indistinguishable from the blue color that is

usually interpreted as a test for peroxidase action. A table is given in which the effect of Fe compds. of diverse types on various solns. of benzidine, with and without H_2O_2, of pyrogallic acid, and of KI, with H_2O_2, is given. The general conclusion is opposed to a classification of Fe as active or inactive. MILTON HANKE

The resorption of carbon dioxide through the skin. STEPHEN HEDIGER. *Klin. Wochschr.* 7, 1553-7(1928).—The diffusion of CO_2 into and out of the skin can be studied by attaching a glass vessel contg. a soln. of CO_2 to some flat area of the body and analyzing the liquid for CO_2 from time to time. An equil. is established when the CO_2 pressure is approx 40-50 mm. Hg. The loss of CO_2 from liquids of high concn. or the acquisition of CO_2 by distd. water placed in contact with the skin follows the laws of diffusion. As much as 200 cc. CO_2 per min. can be absorbed by a person bathing in a natural water that contains CO_2. MILTON HANKE

Thelykinin in bile. M. A. GSELL-BUSSE. *Klin. Wochschr.* 7, 1606(1928).—A brief report. The detailed report is to appear in *Arch. ges. Physiol.* M. H.

Structure and enzyme reactions. IV. The system: glycogen-amylase-lipoids. RICHARD TRUSZKOWSKI. Biochem. Lab., Warsaw Univ. *Biochem. J.* 22, 767-72 (1928); cf. *C. A.* 22, 1985.—Amylase is adsorbed upon lipoids to about 67% of the quantity in soln. The enzyme can be completely eluted by narcotics, only partially by glycogen and altogether resists the action of water. The addn. of lipoids to the system glycogen-amylase retards hydrolysis. Amylase, it seems, when adsorbed by lipoids is inactivated, and the activity can be restored by elution. B. H.

Studies of lipin-protein complexes. I. Lecithin-caseinogen complexes. THOMAS R. PARSONS McGill Univ. Clinic, Montreal. *Biochem. J.* 22, 800-10(1928).—The percentage of lecithin in the ppts. obtained by the addn. of a mixt. of lecithin and caseinogen to buffer solns. of graded acidity increases with increasing H-ion concn. of the medium. When mixts. of caseinogen and increasing quantities of lecithin are added to the same buffer soln. the increase in the percentage of lipin in the several ppts. becomes more and more gradual. BENJAMIN HARROW

Structure and enzyme reactions. Parts V and VI. The system: glucose-enzyme and ester catalyst. STANISLAUS JOHN PRZYLECKI, WENCESLAUS GIEDROYĆ AND ERNEST A. SYM. Biochem. Lab., Warsaw Univ. *Biochem. J.* 22, 811-25(1928); cf. *C. A.* 22, 1985.—In the system enzyme + concd. glucose soln. ⇄ enzyme + hexobiose + H_2O, the reaction attains a definite equil. point, the value of which, in systems without charcoal, depends upon the initial concn. of glucose. This system can be used for the demonstration of the postulate that structure may influence reaction by changing the value of K and so augmenting synthesis, since the hexabiose formed is considerably more adsorbed than glucose, in solns. contg. over 20% of the latter and 1·2% of maltose. The reaction, acid + alc. ⇄ ester + water, proceeds under the catalytic influence of HCl in a medium contg. excess of alc. The addn. to this system of prepns of charcoal, which largely adsorb the org. acid, but not the ester, brings about the acceleration of hydrolysis. BENJAMIN HARROW

Phosphatases of mammalian tissues. HERBERT D. KAY. London Hospital. *Biochem. J.* 22, 855-66(1928).—The phosphatases of mammalian tissue have an optimum p_H between 8.8 and 9.3. Probably the same enzyme is responsible for the hydrolysis of glycerophosphate, of hexosediphosphate and of nucleotide. In the presence of the alc. concerned, inorg. phosphate can be esterified, using phosphatases as catalysts. In this way glycerophosphoric acid has been synthesized from glycerol. BENJAMIN HARROW

Hemoglobin as catalyzer. W. HEUBNER. *Naturwissenschaften* 16, 515(1928).—Referring to Warburg's (*C. A.* 22, 3672) recent note, it is pointed out that hemoglobin can under special conditions (high concn.) act as a catalyzer. A hydroquinone soln. can be made to absorb O by addn. of $^1/_{200}$ equiv. hemoglobin, likewise hydrazobenzene, phenylhydroxylamine and chlorate (cf. H. and Meier, *C. A.* 18, 1306). B. J. C. VAN DER HOEVEN

Clinical contribution to the action of ultra-violet rays in rickets and spasmophilia with special reference to blood phosphorus and calcium. GIUSEPPE VITETTI. *Pediatria Rivista* 36, 925-32(1928).—In a group of 18 children 9 months to 2.5 yrs. old an ultra-violet irradiation of 4 min. caused an increase of inorg. P in rickets and of Ca in spasmophilia. MARY JACOBSEN

Effect of arsenic compounds on animal enzymes. A. FIORI. *Rass. clin. terap. sci. affini* 27, 172-6(1928).—The inhibiting effect of As on amylase is confirmed. It was especially pronounced with glycerol exts. of glands. Na_3AsO_4 is more effective than Na_3AsO_3 or Me_2AsO_2Na. MARY JACOBSEN

An outline of the use of ultra-violet radiation in dermatology. W. Kerr Russel. *Am. Med.* **34,** 390–2(1928). Frances Krasnow

Hematogenic carbohydrate decomposition. Artur Abraham and S. Friedberg. Krankenhaus der judischen Gemeinde zu Berlin. *Arch. Verdauungs-Krankh.* **42,** 513–9(1928).—Glycogen and starch plus defibrinated blood produce lactic acid within 8 hrs. at 37°. Glycogen yields more acid than starch. Frances Krasnow

Influence of salts on the isoelectric behavior of proteins. Kinsuke Kondo and Tsunetomo Hayashi. *Bull. Chem. Soc. (Japan)* **3,** 146–51(1928); cf. *C. A.* **21,** 2284.—Curves are given illustrating the change of the isoelec. reaction of solns. of rice glutelin, and of the change of precipitability of the isoelec. rice glutelin upon adding to the solns. the chlorides of Rb, K, Na, Li, Ba, Ca, Mg, Co, Ni, Cu, Al and Fe. These curves indicate that both the isoelec. reaction as well as the isoelec. soly. of the protein vary according to the nature of the cation added, as well as according to its valence. "The ppt. may be due to the formation of a complex combining the protein and one component of the salt." No exptl. data are presented. W. D. Langley

Physiological effects of Röntgen radiation upon normal body tissues. Stafford L. Warren. Univ. Rochester. *Physiol. Rev.* **8,** 92–129(1928).—General review with extensive bibliography. E. R. Long

The anaerobic oxidases. H. S. Raper. Univ. Manchester. *Physiol. Rev.* **8,** 245–82(1928).—General review with extensive bibliography. E. R. Long

The precipitation of blood calcium by lead. Fritz Bischoff and L. C. Maxwell. Potter Metabolic Clinic and Santa Barbara Cottage Hosp., Cal. *J. Biol. Chem.* **79,** 5–17(1928).—"$Pb(AcO)_2$ added to serum with or without CO_2 tension ppts. a mol. equiv. of ultrafilterable Ca and an amt. of inorg. P required for the formation of $Pb_3(PO_4)_2$ and $Ca_3(PO_4)_2$. Since the amt. of Ca thrown out is independent of the p_H (6.9 to 8.3) and of the concn. of PO_4, CO_3, and Ca ions, the reaction is not immediately concerned with the soly. product of $CaCO_3$ or $Ca_3(PO_4)_2$. The reaction is a sp. Pb effect." A. P. Lothrop

The mechanism of enzyme action. II. Further evidence confirming the observations that ethylene increases the permeability of cells and acts as a protector. F. F. Nord and Kurt W. Franke. Univ. of Minn. *J. Biol. Chem.* **79,** 27–51(1928); cf. *C. A.* **22,** 1368.—By bubbling C_2H_4 through freshly prepd. yeast juice zymase solns. were obtained which not only maintained full activity for 65 days but showed an increased activity. The zymase was protected from the destructive action of protease in the juice. With living yeast cells the permeability of the treated yeast was greatly increased and the surface protected from the action of the products of fermentation. The effect on the permeability of cells in tissues was demonstrated by a marked increase in O_2 evolution by catalase in tobacco leaves treated with C_2H_4. The capacity of pyruvic acid to inactivate yeast could also be decreased by C_2H_4 treatment even during relatively long contact of the yeast with the acid. C_2H_4, therefore, is capable of being charged as a protector on sensitive biol. surfaces and due to adsorption it is also able to increase the permeability of cells. It is unlikely that the association between enzymes and substrate belongs in the group of true mol. combinations; it is more likely that the reactions are governed by purely physical forces. A. P. Lothrop

The electrometric titration of hemin and hematin. James B. Conant, Gordon A. Alles and C. O. Tongberg. Cal Inst. of Tech. and Harvard Univ. *J. Biol. Chem.* **79,** 89–93(1928), cf. *C. A.* **22,** 1986.—Satisfactory electrochem. titration curves can be obtained with alk. hemin and hematin solns. if $TiCl_3$ is used as the reducing agent. The results are very definite and show that the change involves only 1 equivalent. The expts. confirm the recent results obtained using entirely different methods by Haurowitz (*C. A.* **21,** 1661) and Hill (*C. A.* **21,** 3064), which show that the reduction of hematin, like that of methemoglobin, is the change from a ferric to a ferrous compd. A. P. Lothrop

Studies on metal proteins. VII. The variations in certain physico-chemical properties of egg albumin treated with powdered cobalt. G. B. Bonino and A. Carello. *Arch. sci. biol.* (Italy) **11,** 212–6(1928); cf. *C. A.* **22,** 3177.—In previous expts. the effect of Co on gelatin was investigated and evidence brought forth showing that certain facts could be deduced theoretically by considering gelatin as a "colloidal ampholyte." In this expt. the action of Co on egg albumin was studied in order to compare its behavior with that of gelatin as to (*a*) elec. cond. and (*b*) variation in H-ion concn. (*a*) Egg albumin was dild. with 3 times its vol. of distd. H_2O. The globulins were filtered off and the filtrate contg. the albumin was used. Part of the filtrate was brought into contact with powd. Co and its elec. cond. measured. At 25° the elec. cond. for egg albumin soln. before fixation with Co was (K) 0.00368, after

fixation with Co 0.00372. Since the difference in K was too small to draw any deductions, the cond. was decreased by dialyzing out the electrolytes. The K of albumin soln. before dialysis was 3.23×10^{-3}, after dialysis 0.052×10^{-3}. The cond. of albumin soln. after fixation with Co powder and then dialyzing was 0.1180×10^{-3}. Thus there was a distinct increase in elec. cond. due to the fixation of Co. (*b*) Albumin solns. were dialyzed against various concns. of HCl ($N/512$, $N/1024$, $N/2048$) and distd. H_2O. The p_H of the solns. at equil. with HCl was 5.50, 6.20, 6.50 and 6.66, resp. Albumin solns. were brought in contact with Co powder and treated similarly. The p_H at equil. was 6.56, 6.88 7.19, and 7.29, resp. There was a definite increase in p_H, which proves, therefore, that in the case of egg albumin the same general theoretical deductions can be drawn as with gelatin. **VIII. The activity of cobalt ions in cobalt-albumins.** *Ibid* 217–23.—The fixation of Co by albumin was studied exptly. on the basis of Donnan's membrane equil. Samples of albumin at various p_H were placed in collodion sacs in equil. with dil. HCl of different concns. When equil. was reached, the sacs were suspended in beakers filled with distd. H_2O at the bottom of which was placed powd. Co reduced with H. The samples of albumin were then placed in equil. with the external liquid, the p_H was detd. and also the concn. of Co in the external and internal liquid of the membrane. From Donnan's membrane equil. the following relation should hold: $A_{2H}/A_{1H} = \sqrt{A_{2Co}/A_{1Co}}$. A_{1H} and A_{2H} were detd. by the usual methods. The concns. of Co were measured by chemical-analytical methods. Tables are given showing the p_H of the metal-albumin, A_{1H}/A_{2H}, A_{1Co}/A_{2Co}, and $\sqrt{A_{1Co}/A_{2Co}}$, also p_H of metal-albumin and $\sqrt{f_1 Co}$. At low p_H, the coeff. of activity for Co^{++} approached unity. With increasing p_H, the coeff. of activity of Co^{++} diminished rapidly in Co-albumin; increasing the p_H had a tendency to bring about intermolecular reactions which masked the osmotic and electrochem. effects. There is thus a relation between H-ion concn. of an albumin soln. and the action which the albumin exerts on the activity of the Co^{++} ions. PETER MASUCCI

The surface tension of protein solutions at various hydrogen ion concentrations, before and after jellying. G. PUPILLI. *Arch. sci. biol.* (Italy) **12,** 373–92(1928).—The aim of these expts. was to show whether the low temps. causing albumin or gelatin to jelly would produce const changes in the surface tension of these protein solns. The solns. tested covered a range of p_H 2.0 to 10.0. Serum albumin solns. were dialyzed against distd H_2O for 30–40 days; they were then filtered. The albumin content was detd. by the refractometer. Gelatin solns. were prepd. according to the method of Dhéré and Gorgolewski; the p_H was detd. electrometrically the surface tension was measured by the Traube stalagmometer. Low temps. (—12–18°) were obtained with ice-salt mixts. Each soln. was tested for p_H and surface tension; it was then allowed to gel in the cooling mixt. for 30–45 min.; and then allowed to liquefy at room temp. The following day the surface tension was again detd. The results are reported in tables giving the p_H, the surface tension before and after jellying, and the concn. of the albumin or gelatin. Conclusion: The surface tension of serum albumin and gelatin which have been exposed to congealing temps. and then liquefied is increased when the solns. are at the isoelec. point (p_H 4.7), or at H-ion concns. close to it; it is unchanged between p_H 3.0–3.4 and p_H 8.0–9.0, and increases perceptibly beyond these zones. The phenomenon is attributed to the formation of mol. aggregates in the liquid, and to the various states of hydration of the protein particles. PETER MASUCCI

Partial hydrolysis of phosphoric acid from hexose-diphosphate by yeast. C. NEUBERG AND J. LEIBOWITZ. *Biochem. Z.* **191,** 450–5(1927).—Hydrolysis of hexose-diphosphate by the phosphatase of *Aspergillus oryzae* proceeds through the hexose-monophosphate stage. **The transformation of zymo-diphosphate into hexose-monophosphate ester by means of animal phosphatase.** *Ibid* 456–9(1927).—**Arsenate activation and the specificity of phosphatase.** *Ibid* 460–5(1927).—Evidence is adduced to show that there are at least 2 sp. phosphatases. Activated by arsenate, the taka-phosphatase yields principally Neuberg's ester ($[\alpha]_D = +24°$) while the kidney phosphatase gives practically pure Robison ester ($[\alpha]_D = +27°$). Without the arsenate activation only a mixt. of partial hydrolysis is obtained, *i. e.*, both monophosphate esters. S. MORGULIS

Structure of hexose-phosphate ester and of methylglyoxal according to the spectrographic behavior. CARL NEUBERG AND SVEND AAGE SCHOU. *Biochem. Z.* **191,** 466–71(1927).—Absorption curves for hexose-diphosphate, Neuberg's and Robison's ester and methylglyoxal are given. S. MORGULIS

Comparative studies on the influence of mountain climates on the blood catalase. A. I. ALEKSEEV. *Biochem. Z.* **192,** 41–57(1928).—In the first 3–4 weeks of sojourning

in the mountains there is an increase in the no. of erythrocytes, viscosity and catalase content of the blood. The blood catalase shows an av. increase of 70% during a 6–7 weeks sojourn, while the red cells show an increase of 38%. Towards evening the catalase activity diminishes 10–20% which is attributed to the effect of an anticatalase.
S. MORGULIS

The condition of the serum calcium. A. NITSCHKE. *Biochem. Z.* **192,** 123–7(1928); cf. *C. A.* **21,** 425.—According to the Donnan equil. the equil. const. of a supersatd. $CaCO_3$ soln. at 37° is $Ca^{++} \times HCO_3^-/H^+ = K = 2570$. At p_H 7.35 and HCO_3 67.2 vol. % the ionization limit of Ca is attained at 14.5 mg. %. For supersatd. $Ca_3(PO_4)_2$ at 37° the equil. const. is $Ca^{++} \times HPO_4^- = K = 67 \times 10^{-7}$. At p_H 7.35, 3.7 mg. % P and 10 mg. % Ca, 2.4 mg Ca is calcd. to be the mol. form as $CaHPO_4$, 2.0 mg. Ca in combination with serum protein and 5.6 mg Ca ionized. S. MORGULIS

Influence of different preparations of the quinine group on the enzymic functions of the organism. VIII. Digestion of edestin by pepsin in the presence of quinine-hydrochloride. I. A. SMORODINTZEV. *Biochem. Z.* **195,** 1–7(1928).—The diln. of the enzyme soln. with H_2O 1:8, or with 0.1% HCl, has no influence on the p_H of mixts. of pepsin and edestin. Quinine HCl of 0.2% concn. has no effect on the edestin digestion by pepsin. By increasing the quinine-HCl concn. to 0.5% there is sometimes observed a certain inhibition, which, however, can be counteracted by a slight increase in acidity. It is, therefore, concluded that the inhibition is due to a shifting of the reaction of the medium to the alk. side. Furthermore, by increasing the acidity of the mixt. to p_H 1.7 there is inhibition by quinine. S. MORGULIS

Molecules and ions in plasma. R. KELLER. *Biochem. Z.* **195,** 14–19(1928).—Physics in the last few years has furnished proof that strong electrolytes have very little mobility. Capillary chemistry has also shown that in the immediate vicinity of membranes, proteins or hydrophile colloids which generally are neg. charged the anions are entirely immobile while the cations are strongly inhibited. Exptl. studies of the permeability of animal and plant plasma membranes show that strong acids and bases do not pass into the living substance while strong electrolytes do so very slowly and to a very limited extent S. MORGULIS

Studies on the function of the cells of the recticulo-endothelial apparatus. A contribution to the permeability problem. N. OKUNEV. *Biochem Z.* **195,** 28–39 (1928).—Various colloids or watery suspensions which are taken up by the cells of the reticulo-endothelial system (trypan blue, carmin, cholesterol, India ink. colloidal Ag or Au, erythrocytes and bacteria) lower the surface tension of a H_2O-benzene, or H_2O-olive oil phase. It follows that these substances will tend to accumulate in the lipoid or lipoid solvent phase of a H_2O-lipoid system. S. MORGULIS

Enzymes and light. X. Diastase. 5. LUDWIG PINCUSSEN AND SUSUMI KUMANOMIDOH. *Biochem. Z* **195,** 79–86(1928).—Addn. of salts to salivary diastase or to malt diastase increases its instability to light rich in ultra-violet rays whereby K has the strongest and Ca the weakest effect In expts on the inactivation by heat the reverse situation is found in the ionic antagonism. **XI. Pepsin. 1.** LUDWIG PINCUSSEN AND KIKUSJI UEHARA *Ibid* 87–95(1928).—Pepsin is inactivated by exposure to light rich in ultra-violet rays, the loss of enzyme activity being related to the p_H of the mixt. It is greatest at p_H 1.15 and least at p_H 2.28 **XII. Lipase. 1.** LUDWIG PINCUSSEN AND SHIGERU HAYASHI *Ibid* 96–102(1928).—The serum lipase and esterase are much injured by exposure to light rich in ultra-violet rays. S. M.

Acyloin cleavage by means of enzymes from acetic acid bacteria. TORAO KITASATO. *Biochem. Z.* **195,** 118–27(1928). S. MORGULIS

Experimental studies on the influence of ultra-violet rays on the position of the "oxidation quotient" in urine. J. SPIRT. *Biochem. Z.* **195,** 142–8(1928).—The "oxidation quotient" is the ratio between amt. of O_2 required completely to oxidize the urinary N and the quantity of N excreted. This quotient is const in dogs (0.5–0.6) and the daily variations for the same dog are insignificant when the animals are kept on a diet sufficient to cover their N need. Radiation with ultra-violet rays causes a change in this quotient, increasing or diminishing according to the intensity of the radiation. Since the amt. of N excreted remains the same under these conditions the variations in the quotient are due to changes in the O_2 Radiation with the Hg lamp for 1/2 hr. at 80 cm. increases the quotient and hence inhibits the oxidative process. More intense radiation (1 hr. at 60 cm.) causes a lowering of the quotient, or an increased oxidation. In control dogs, kept in the dark, the quotient remained unaffected.
S. MORGULIS

Ultramicroscopic observations on the influence of inorganic ions on the dispersion of egg albumin and hemoglobin at different hydrogen-ion concentrations. VERA

SCHRÖDER. *Biochem. Z.* **195**, 210–9(1928).—The state of dispersion of egg albumin and hemoglobin solns. was detd. by counting the number of ultramicroscopic particles. The max. of flocculation which is observed at a certain H-ion concn. is altered through the addn. of salt. These were usually in a concn. of 0.05–0.10 *M*, *i. e.*, within the physiol. range. Anions shift the max. flocculation toward the acid side in the following order, $SO_4 < HPO_4 < Cl, Br, I < SCN$. Of the cations Ca and Mg have a definite effect, shifting the max. slightly to the alk. side. S. MORGULIS

Studies on iodine as a biogenous element. XV. Animal organs and products and their iodine content. K. SCHARRER AND J. SCHWAIBOLD. *Biochem. Z.* **195**, 228–32(1928).—The I_2 content of heart, liver, lung, kidney, spleen, fat and muscle of pigs varies from 5.5 to 40γ. Following long feeding with iodides the max. content is not very much increased, the greatest increase being in the liver, kidney and spleen (max. 66γ). The milk of cows and sheep fed on pastures close to or actually run over by the sea contains 300–800% more I_2 than from Swiss or Oberbayern cows. **XVI. The presence of iodine in feed and in artificial fertilizers.** *Ibid* 233–7.—Feed of sea origin (fish cake) was found to be especially rich in I_2. A high I_2 content was also found in fertilizers from crude phosphates. The superphosphates are particularly rich in I_2 in spite of their acid reaction. In Chile saltpeter no periodate was found and only traces of iodide, the bulk of the I being there in the form of iodates which are changed to iodides by reduction. S. MORGULIS

Effect of dilution on the p_H of buffer mixtures. I. M. KOLTHOFF. School of Chem., Univ of Minnesota. *Biochem. Z.* **195**, 239–47(1928).—Using the Debye-Hückel equation of the ionic-activity coeff and assuming an av. ionic diam. of 4×10^{-8} the influence of diln. on the p_H of common buffer mixts. can be calcd. For the calcn. of the citrate buffer p_H an av. diam. of 6.5×10^{-8} should be used. The diln. effect in the boric acid- borate buffer cannot be calcd. from this equation. S. MORGULIS

The regulation of the hydrogen-ion concentration in blood. IV. Studies on the chemical properties of quinone, hydroquinone and quinhydrone and their relation to the reduction-oxidation systems of the blood. SCHAU-KUANG LIU. III. Med. Klinik, Univ. Berlin. *Biochem. Z.* **195**, 248–73(1928).—Quinone, hydroquinone and quinhydrone produce irregular potential differences, and this is also true for the filtrates from their satd. solns. Satd. solns. of quinone have a smaller potential difference, those of hydroquinone a higher and of quinhydrone one intermediate between the two, from which it is concluded that quinone and hydroquinone are relatively more acid and alk., resp., while the quinhydrone is more neutral The rise in potential is a function of the reduction process of the system, $[C_6H_4O_2][H]^2/[C_6H_4(OH)_2] = Kr$, while the fall in potential is a function of the oxidation, $[C_6H_4(OH)_2][O]/[C_6H_4O_2] = Ko$. The potential is therefore directly proportional to the reduction and inversely proportional to the oxidation of the quinhydrone. The reduction of quinone is generally not measurable but the oxidation of hydroquinone is easily detd. Quinone is thus more sensitive to reducing agents and hydroquinone to oxidation agents The reduction and oxidation of the quinhydrone change not only the $[H^+]$ but also the number of charges resulting from these reactions. The e. m. f. $= RT/n \ln Ks + RT/n \ln [C_6H_4O_2][H^+]^2/[C_6H_4(OH)_2][O^{--}]$. Quinone, quinhydrone and hydroquinone can convert oxyhemoglobin and possibly also reduced hemoglobin to methemoglobin, the effect of the first two being very rapid. **V. Studies on the effect of separate salts, acids and bases, as well as temperature, on the changes in potential of quinone, hydroquinone and quinhydrone.** *Ibid* 274–300.—The velocity of soln. satn. and oxidation-reduction can be measured with the quinhydrone chain. The relation between the changes in potential and the rate of these reactions is worked out. The shift in the quinhydrone potential is not influenced by dil. salt solns. but is slowed down or even inhibited by satd. salt solns. The rate of soln. and satn. of quinhydrone quinone and hydroquinone is not doubled by a 10° rise in temp. The shift of the quinhydrone potential is marked in neutral soln. and is much greater in an alk than in acid medium. **VI. The thermodynamic action of different standard solutions on the quinhydrone chain.** *Ibid* 301–8.—The variation in potential of standard acetate solns. and quinhydrone electrode fluid is practically a linear function of the temp. variation, and is to a certain degree reversible. The sources of error of the quinhydrone chain due to temp. variations are discussed and it is shown that for p_H detns. the abs. temp. of both electrodes must be considered. **VII. The relation of buffering to the different chemical reactions of quinone, hydroquinone and quinhydrone, and the buffer regulation of the chemical reactions of blood and body fluids.** *Ibid* 309–35.—The potential is directly proportional to the diminution in H^+ and inversely proportional to its increase. **VIII. Effect of temperature on the shift of potential**

of serum, plasma, blood, blood cell suspension and hemoglobin with the quinhydrone electrode. *Ibid* 336–63.—The reaction velocity or the rate of potential fall of a 1:4 dild. serum is very nearly doubled through a 10° rise in temp. over the range of 10° to 40°, which holds also for similarly dild. blood. Low temp. is better suited to the detn. of the initial potential of serum, plasma, dild. blood or dild. hemoglobin solns. because the reaction velocity is thereby considerably slowed down. The chief defect of the quinhydrone chain for the detn. of blood p_H is in the reduction which takes place between quinhydrone and H^+ or hemoglobin, resulting often in readings which are too high. S. MORGULIS

Hormones and adsorption. H. ZONDEK AND H. W. BANSI. Krankenhaus Urban. *Biochem. Z.* **195**, 376–86(1928).—The adsorption of adrenaline on animal charcoal follows Freundlich's adsorption isotherm, and is greatly inhibited by narcotics. The inhibiting effect of the narcotics follows Richardson's law of the homologous series. Ca ions in small doses seem also to inhibit the hormone adsorption, but higher concns. of Ca ions and small doses of caffeine increase the adsorption of adrenaline by charcoal. S MORGULIS

The effect of lipoids on the diffusion of acids and alkalies in jellies. S. I. AFFONSKII. Biochem. Lab , Veterinary Inst., Kasan. *Biochem. Z.* **195**, 387–95(1928). Lecithin and cholesterol have an antagonistic effect on the diffusion of acids and alkalies in jellies, the former causing inhibition while the latter increases the diffusion The stimulating effect of the cholesterol is relatively weaker than the inhibiting action of the lecithin. With high concns. of cholesterol, however, the diffusion is likewise hindered. S. MORGULIS

The photocapillary reaction of plant phosphatides. I. Effect of salts on the reaction. FERD. HERČIK. Pflanzenphysiol. Inst., Brünn. *Biochem. Z.* **198**, 81–7 (1928); cf. *C. A.* **22**, 972 · Plant phosphatides which dialyze from pea seeds into salt solns. have a surface tension which rises or falls (+ or − photocapillary reaction) in a characteristic manner Cations promote this reaction while anions are practically without effect. **II. Photocapillary reaction in the presence of iron.** *Ibid* 88–97.—The photocapillary reaction of plant phosphatides dialyzed against different solns of $Fe(NO_3)_3$ was studied. The sign of the photocapillary reaction is detd. by the concn. of the soln , being pos in high and neg. in low concns. The greatest pos. reaction was observed in 0 01 *M* $Fe(NO_3)_3$ S. MORGULIS

The influence of fluorine on urease. MARTIN JACOBY. Krankenhaus Moabit, Berlin. *Biochem. Z.* **198**, 163–74(1928) ·F exerts the strongest effect on urease under the optimum conditions for the enzyme action. The F effect is obviously sp. for urease though there is no evidence of a stoichiometric relationship between the two. Soy bean prepns. obtained in Germany are also very good. Even the freshly prepd. Jack bean meal is activated by KCN Urease adsorbed on cholesterol can be dissolved by H_2O. By repeating the adsorption many times the adsorption is quantitatively increased. Diminishing the urease concn the adsorption by cholesterol can be at first reduced to a min. but this increases once more upon further diminution of the concn. S. MORGULIS

The non-protein serum colloids and their biological significance. KAZUTANE NIKAIDO. Krankenhaus Moabit, Berlin. *Biochem Z.* **198**, 175–94(1928) – Normal serum contains a substance which inhibits the agglutination of red blood cells by Jack bean. This inhibitory substance was found in rabbit, horse and human serum. This effect was strong only with purified agglutinin whereas against the agglutinating action of the crude bean prepn. it was slight The substance is pptd. from serum with 65% satn. with $(NH_4)_2SO_4$. It is insol. in lipoid solvents by which it is not injured. If the deproteinization of the serum is carried out in acid medium (KH_2PO_4) a very potent inhibitory soln. is obtained. The substance is not adsorbed by kaolin before deproteinization, but is completely removed from the protein-free filtrate. Results with cholesterol were more or less similar to those with kaolin. The substance is nondialyzable, and in electrodialysis it is partly adsorbed on the ppt. which is formed. Zsigmondy's ultra-filter which retains protein does not allow this substance to pass, whereas the Chamberland filter retains the inhibitory substance but allows the proteins to go through. The Jack bean agglutination is not inhibited either by glycogen or by Cu and Fe colloids. The substance is fairly resistant to boiling with strong acid or alkali and is resistant to putrefaction It possesses colloidal properties different from those of protein or lipoid. S. MORGULIS

The occurrence of free aldehyde groups in enzyme solutions. FERDINAND LEHR. Krankenhaus Moabit, Berlin. *Biochem. Z.* **198**, 204–5(1928).—In very active enzyme prepns. (urease, Takadiastase, pepsin, trypsin and catalase) the presence of free alde-

hyde groups could not be demonstrated by the aid of the very sensitive fuchsin-H_2SO_3 reagent. S. MORGULIS

Permeability. I. TRAUBE AND F. DANNENBERG. Techn. Hochschule, Berlin-Charlottenburg. *Biochem. Z.* **198,** 209-24(1928).—Exptl. evidence is offered to show that the theory of the presence of pores in membranes is untenable. S. MORGULIS

Effect of ultra-violet light on the dehydrogenases of pyruvic and glycerophosphoric acids. SVEN JUNGHAGEN. Univ. Lind. *Skand. Arch. Physiol.* **54,** 115-9(1928).—Dehydrogenases of pyruvic and glycerophosphoric acids like other enzymes are very rapidly destroyed by ultra-violet radiation. S. MORGULIS

Chemistry of bilirubin. I. Behavior of bilirubin in various solvents at variable hydrogen-ion concentrations. WILLIAM KERPPOLA AND ERKKI LEIKOLA. Univ. Helsingfors. *Skand. Arch. Physiol.* **54,** 120-6(1928).—The soly. of bilirubin in H_2O is closely associated with the H-ion concn., being greater the more alk. is the liquid; in acid soln. it dissolves with difficulty. Even in the special bilirubin solvents (Et_2O, $CHCl_3$, CS_2, C_6H_6, toluene) the soly. is greatly influenced by the H-ion concn. so that the color of the bilirubin soln. does not indicate the true total quantity unless the p_H of the soln. is also known. S. MORGULIS

The catalase system in animal tissues under different physiological and pathological conditions. II. Determination of catalase and anticatalase in the tissues of normal guinea pigs and white rats. E. D. GAGARINA AND V. D. YANKOVSKII. *Zhurnal exptl. biol. Med.* **9,** 50-7(1928); cf. *C. A.* **21,** 3636.—Aq. exts. from various organs of guinea pigs and white rats lose some of their catalase activity especially when exposed to 37°. This loss of activity is attributed to inactivation by an anticatalase, and this inactivation can be prevented by the addn. of alc. in concn. of 1:10,000. Organs with the greatest catalase content also show the largest anticatalase content. **III. Effect of chronic intoxication with morphine, arsenic and alcohol.** *Ibid* 59-67(1928).—Intoxication with morphine causes generally an increase in the catalase content of all tissues except the blood, where there is actually a decrease. The greatest rise was found in the liver and muscles. The anticatalase diminishes except in the liver and muscles. Chronic As poisoning causes a considerable increase in both catalase and anticatalase except in the blood, where there is a great diminution. Chronic alc. poisoning produces in white rats a fall in the catalase-anticatalase content of the liver and kidney and a rise in the blood and muscles. The catalase-anticatalase content is reduced particularly in those organs where the alc. causes much degenerative change. In guinea pigs alc. poisoning calls forth much less pronounced alterations of the catalase. S. MORGULIS

Nomenclature in biological chemistry. M. MACHEBOEUF. *Bull. soc. hyg. aliment.* **16,** 277-82(1928).—A general review of the decisions adopted at the 1923, 1924, 1925, 1926 and 1927 conferences of the International Union of Pure and Applied Chemistry. A. PAPINEAU-COUTURE

Jacques Loeb. W. J. V. OSTERHOUT. *J. Gen. Physiol.* **8,** No. 1, IX-LIX (1928).—Biography. C. H. R.

Jacques Loeb. Bibliography. (MISS) N. KOBELT. *J. Gen. Physiol.* **8,** No. 1, LXIII-XCII(1928).—Bibliography of 404 titles arranged chronologically. C. H. R.

The influence of surface charge and of cytoplasmic viscosity on the phagocytosis of a particle. E. PONDER. New York Univ. *J. Gen. Physiol.* **11,** 757-77(1928).—This is a math. consideration of the phagocytosis of a particle. General conclusions: The greater the cytoplasmic viscosity, the less likely it is that particles will ultimately be ingested because high cytoplasmic viscosity tends to render the particle liable to removal by forces generated by movements of the surrounding fluid. The more rapid the rotation of the cell the less probable that the particle will be ingested. Ingestion is less likely to occur in a fluid in which the cells are moving with great velocities relative to their surroundings, allowance being made for any greater no. of collisions which may occur between cell and particle. These conclusions are considered only as approximations incapable of exptl. verification except in a general way. C. H. R.

The mechanism of the inflammatory process. III. Electrophoretic migration of inert particles and blood cells in gelatin sols and gels with reference to leucocyte emigration through the capillary wall. H. A. ABRAMSON. Kaiser Wilhelm Inst., Berlin-Dahlem. *J. Gen. Physiol.* **11,** 743-56(1928); cf. *C. A.* **22,** 439.—Particles of quartz and of certain other substances move cataphoretically in certain soft gels with the same velocity as in the sol. The speed is a function of the true viscosity of the sol or gel, and in soft gels is apparently not altered by the presence of gel structure. This is compatible with the fact that certain sols undergo gelation without change of true viscosity although the apparent viscosity changes markedly. Red blood cells in soft gelatin-serum gels migrate through the sol or gel with about twice the speed of leuco-

cytes and quartz particles. The latter two substances have the same velocity in this medium. The abs. viscosities are only slightly decreased by the presence of the gel. In stiffer gels, leucocytes, red blood cells and quartz particles move with equal velocity When the gels are mechanically softened, the red blood cells resume their independent velocity of migration Cataphoretic movement of particles in gelatin gels is different from that produced by magnetic force or the force of gravity. The mech. nature of obstruction to the cataphoretic migration of leucocytes and red blood cells in fibrin gels is described. Polymorphonuclear leucocyte emigration and migration are probably dependent upon p. ds in the capillary wall C. H. RICHARDSON

The mechanism of tonic immobility in vertebrates. H. HOAGLAND. Harvard Univ. *J. Gen. Physiol.* **11,** 715-41(1928).—Tonic immobility ("death feigning") in the lizard (*Anolis carolinensis*) was studied as a function of temp. The exptl. data which show the rate of change of the process when plotted as a function of temp. according to the Arrhenius equation are distributed in 2 straight line groups with temp. characteristics (μ) of 31,000 and 9000 cals., resp. The results are interpreted by assuming the release, through reflex simulation, of hormones, one effective between 5° and 35°, the other between 20 and 35°. They probably act as selective inhibitors of impulses from "higher cente[illegible] [illegible]mitting impulses from tonic centers to pass to the muscles. Other physiol. inf[illegible] [illegible] on this subject is given C. H. RICHARDSON

The influence of p_H upon th[illegible] [illegible]oncentration potentials across the skin of the frog. W. R. AMBERSON AND H. KLEIN[illegible] Univ [illegible] [illegible]rine Biol. Lab., Woods Hole, Mass. *J. Gen. Physiol.* **11,** [illegible] 41(192[illegible] [illegible]ection of concn. p. ds. across the skin of the frog is related to t[illegible] [illegible] soln. On the alk. side of an isoelec. point, the dil. soln. is positi[illegible] [illegible]gative. If the p_H is suddenly lowered from the alk. to the acid [illegible] of th[illegible] [illegible], a change in polarity may occur in a few secs. The effect i[illegible] [illegible] series of unbuffered solns. at different p_H values is applied reve[illegible] [illegible]btained, with concns. of KCl between 0.1 and 0.001 N, the reve[illegible] [illegible] p_H 4.1 and 4.8. The electromotive behavior of frog skin is c[illegible] [illegible]olyte or group of ampholytes probably protein in nature. On b[illegible] [illegible] points, frog-skin membranes, like protein membranes, behave a[illegible] [illegible] movement through them of ions having the same sign as the membrane [illegible] permitting movement of ions in the opposite direction. This is probably d[illegible] [illegible]lectrostatic effect between the charged surfaces and the ions in soln. C. H. RICHARDSON

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Electric impedance of suspensions of spheres. K[illegible] COLE. Cruft Elec. Lab. and Harvard Univ. *J. Gen. Physiol.* **12,** 2[illegible] 36(1928).—[illegible] [illegible]neral math. expression has been derived for the elec. impedance of a suspension of spheres each with a homogeneous, non-reactive interior and a thin surface layer with both resistance and reactance. Its applications and limitations are discussed. **Electrical impedance of suspensions of Arbacia eggs.** *Ibid* 37 51. T[illegible] specific resistance of the interior of the egg is about 90 ohm cm. or 3.6 times that o[illegible] [illegible]a water. The impedance of the surface of the egg is probably similar to that of a "[illegible]rization capacity." Interior resistance and surface impedance do not appear to be [illegible]lated either to membrane formation or cell division. An app. for the measure[illegible]nt of the elec. impedance of suspensions of *Arbacia* eggs in sea water to alternatin[illegible] currents (1000-15,000,000 cycles per sec.) is described. C. H. RICHARDSON

Dark adaptation in Agriolimax. W. J. CROZIER AND W. WOLF. Harvard Univ. *J. Gen. Physiol.* **12,** 83-109(1928).—Largely physiol. but the assumed underlying photochem. reactions are considered. C. H. RICHARDSON

Oxidation-reduction equilibria in biological [illegible]stems. I. Reduction potentials of sterile culture bouillon. C. B. COOK[illegible] Columbia Univ. *J. Gen. Physiol.* **12,** 139-46(1928).—Sterile bouill[illegible] [illegible]ntains [illegible] autooxidizable substance, the oxidation of which is accompanied by the reducti[illegible] of electromotively active substances such as glutathione or indicator dye. T[illegible] auto[illegible]xidizable substance may exhibit irreversible oxidation and therefore might show no measurable oxidation potential. The

limiting value of negative potential shown by sterile bouillon at p_H 7.6 is similar to that observed for reduced glutathione and for boiled yeast cells in the presence of glutathione. Reduction occurs so long as a certain concn. of glutathione in oxidized form is present and does not proceed below the level of the potential at which glutathione is completely reduced. The expts. suggest that in the catalytic oxidation of some autoöxidizable substances by glutathione, the oxidized form of the latter is active and the change, disulfide to sulfhydryl, is the mechanism for electron transfer. The observed potentials and the oxidation of the autoöxidizable substance measure the free energy of reduction of glutathione or other electromotively active substance. Reduction does not proceed to a more negative level because no system exists to yield measurable potentials. The capacity of bouillon to combine with O_2 is not exhausted after 9 months exposure to air or after successive aerations and subsequent reductions of methylene blue. This suggests that considerations other than those discussed may be required to interpret the observed potentials. Bouillon probably does not contain electromotively active substances in equil. with O_2 according to the equation: oxidized form $\rightleftharpoons O_2$ + reduced form. Degradation products of hemoglobin may be present and provide a dissociable mechanism through which removal of O_2 affects the potentials. The removal of O_2 by deaeration or by combination with some bouillon constituent shows a reduction intensity of [illegible] v., a potential level which would probably be attained by any other O_2 withdrawing process. The development of this reduction intensity in bacterial cultures cannot, therefore, be attributed to the activity of living cells. The potential relations of bouillon are probably not peculiar to that system but involve factors concerned in other biol. solns. A similar study is being made on the growth of *B. typhosus* in sugar-free bouillon. C. H. Richardson

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within this process. The behavior of Warburg's respiratory enzyme is described.
G. Schwoch

Potassium thiocyanate and the diastatic action of saliva and plant diastases. L. R. Johnson and A. Wormall. *Proc. Leeds Phil. Lit. Soc., Sci. Sect.* **1**, Pt. VII, 318–24(1928).—It is not likely that the KCNS present in human saliva is a waste product of detoxication or that it functions as a bactericide. J. and W. believe that its functions are those of an accelerating agent for the action of the diastatic enzymes. For the expts., dialyzed, dild. saliva was allowed to act upon solns. contg. starch, phosphate buffer at p_H 6.7, and varying amts. of KCNS. The temp. was 37°. The rate of digestion of the starch was followed qualitatively by adding I soln. to samples taken at certain intervals and noticing the coloration. The results show that small concns. of KCNS, even such small concns. as may be present in the human saliva, have a distinct accelerating influence on the hydrolysis of starch, as far as the amylolytic action of the enzyme is concerned. Also when NaCl, the addn. of which alone speeds up the reaction, was added to give the optimum concn. of 0.1%, the effect of KCNS could still be observed. Expts. with an enzyme prepn. obtained by pptg. saliva with alc. and dissolving the ppt. in H_2O gave results similar to those obtained with ordinary dialyzed saliva. When glycogen or dextrin was used as substrates, the effect of KCNS was less pronounced. For measuring the accelerating effect of KCNS on the saccharogenic action of saliva, the expts. were carried out similarly as reported above; but instead of the coloration, the amt. of reducing sugar was detd. after a certain time. Using starch, glycogen and dextrin as substrates, none or only a very slight increase of the sugar concn. was seen. KCNS also accelerates the hydrolysis of starch caused by plant diastases, as seen in the expts. with com. malt diastase and a prepn. from potatoes; these findings probably are related to the observation that KCNS has a stimulating influence on the germination of potatoes and barley.
G. Schwoch

Toxicity of nascent elementary tellurium and selenium for enzymes. Richard Labes. Univ. Bonn. *Arch. exptl. Path. Pharm.* **133**, 57–62(1928).—Enzymes are inactivated by elementary Te and Se. G. H. S.

Studies on alcohol. VI. Effect on the action of pepsin. G. Franzen. Univ. Jena. *Arch. exptl. Path. Pharm.* **133**, 111–20(1928).—When added to artificial pepsin digestion prepns. pure EtOH stimulates protein cleavage. Although stimulating in its action in concns. up to 11%, the max. effect is exerted at a 4% concn., and even 30% alc. does not prevent peptic digestion. Wine and beer act similarly, the effect being proportionate to their alc. content. G. H. S.

Relation of irradiation to the threshold of stimulation in the heart. H. Zwaardemaker. *Arch. ges. Physiol.* (Pflüger's) **217**, 1–10(1927).—The inner stimulus for excitation of the heart is about 1 mikroerg per g. per sec. of heart substance. It would appear to be more valid to express the intensity of the irradiation in terms indicating the strength of the prepn. rather than in ergs. Only when the processes of Ra catalysis and origin of radioactive substance are better understood can precision be reached in estimations expressed in ergs. G. H. S.

The nomenclature of biochemistry; a pleasing reform. C. Béguin. *Schweiz. Apoth. Ztg.* **66**, 193–7(1928).—The nomenclature of carbohydrates (cf. Bertrand, *C. A.* **21**, 3376), fats, proteins and sol. enzymes as adopted by the Intern. Union of Pure and Applied Chemistry in 1927, is explained (cf. *C. A.* **21**, 920, 2001, 2482). A list of the bulletins issued is added. S. Waldbott

Role of hexosemonophosphate in enzymic degradation of sugar. Hans v. Euler and Karl Myrbäck. Univ. Stockholm. *Ann.* **464**, 56–69(1928).—The mechanism of the fermentation of dextrose is probably as follows: Under the influence of a synthetic enzyme, phosphatase, Robinson's hexosemonophosphate is formed but no free phosphate or CO_2 appears. The monophosphate, under the influence of a "mutase" and the cozymase, undergoes conversion, half into alc. and CO_2 and half into hexosediphosphate. The latter is converted by a phosphatase into a hexose (levulose?) which enters into the chain of processes given above. The velocity of fermentation of monophosphate by dried yeast is the same as that of a mixt. of equiv. quantities of dextrose and phosphate. A method is described for the detn. of mono- and diphosphate during the course of fermentation. Most prepns. of dextrose monophosphate using dried yeast give a product with $[\alpha]_D$ about 26° (Ba salt, 13°) but when a very strongly phosphatizing yeast was used the product had $[\alpha]_D$ 63° and is probably distinct from Robinson's material. C. J. West

Intracellular hydrogen-ion concentration. I. Methods. Juntaro Ogawa. Imp. Univ., Tokyo. *Proc. Imp. Acad.* **4**, 76–8(1928).—The intracellular H-ion concn. is

detd. by a slight modification of Schmidtmann's method (injection of indicator into the cell) and the results are compared with those obtained by Graff's method. The intracellular p_H of animal tissues decreases fairly rapidly after they have been removed from the body. II. Entamoeba histolytica and E. coli. *Ibid* 79–81.—The p_H of the protoplasma of *E. histolytica* and *E. coli* usually lies between 6.0 and 7.0.
C. J. West

Reaction of tissues. II. Hydrogen-ion concentration in the tissue during experimental acidosis and alkalosis. Juntaro Ogawa. Imp. Univ., Tokyo. *Proc. Imp. Acad.* (*Japan*) **4**, 82–3(1928); cf. *C. A.* **22**, 3928.—When acidosis is produced in an animal, whether by nephrectomy or by the injection of acids, the intracellular p_H decreases and it increases when alkalosis is produced by the administration of sufficient alkali. Injection of insulin increases the intracellular p_H. C. J. West

The reduction potential of cysteine (Michaelis, Flexner) 2. The bile acids. XXI (Schenck, Kirchhof) 10. Ultra-violet radiation of a few organic P compounds following their irradiation (Serono, Cruto) 3. The permeability of membranes (Weech, Michaelis) 2. Composition of bone. V. Some properties of $Ca(NO_3)_2$ (Shear, Kramer) 2. Process of obtaining the maximum of ultra-violet rays with short waves (Iarotzky) 3. Salting out of gelatin into two liquid layers with NaCl and other salts (McBain, Kellogg) 2.

Lazarev, P. P.: **Théorie ionique de l'excitation des tissus vivants.** Coll. de Monographies scientifiques étrangères. Paris: A. Blanchard. 240 pp. F. 40.

Lipase. Shozo Yamamoto. U. S. 1,687,050, Oct. 9. Castor bean refuse is subjected to fermentation, soy bean refuse is added, and the fermentation is continued at a temp. of about 30–40° until protein material in the refuse is converted into a "yeast-like substance," the latter is dissolved by immersing the material in water, and lipase is pptd. from the resulting soln. by use of HOAc.

B—METHODS AND APPARATUS

STANLEY R. BENEDICT

Determination of albumin and globulin in urine. A. Hiller. *Proc. Soc. Exptl. Biol. Med.* **24**, 385–6(1927).—One mg. of biuret gives a color equal to 0.924 mg. of urinary proteins treated with alkali and $CuSO_4$ as described by Autenrieth. The standard soln. is made by dissolving 0.4 g. of biuret in H_2O and dilg. to 150 cc. Five cc. contg. 13.33 mg. of biuret is colorimetrically equiv. to 12.3 mg. of urinary proteins. *For total protein*, enough urine to contain 8 to 20 mg. is pptd. with an equal vol. of 10% CCl_3COOH. The ppt. is redissolved in 3% NaOH, treated at 10 cc. vol. with 0.25 cc. of 20% $CuSO_4.5H_2O$, and compared with 1 cc. of the biuret standard similarly treated. Globulins are pptd. by treating the urine at 38° with an equal vol. of 44% Na_2SO_4. In the filtrate the albumin is detd. according to the method for total proteins. Globulins are calcd. as total protein minus albumin. C. V. B.

Estimation of the acid-combining capacity of a protein by means of the interferometer. Arthur W. Thomas and Charles W. Mayer. Columbia Univ. *Proc. Soc. Exptl. Biol. Med.* **25**, 667–9(1928).—In using a differential refractometer (interferometer) capable of measuring small changes in *n* to which an immersion refractometer is insensitive, it was found that the *n*s of mixed solns. of gelatin and of HCl are not additive. However, the refraction of mixed solns. of gelatin chloride and of HCl are additive. When a soln. of gelatin is titrated with an acid, an abrupt change in slope of the curve (refraction as function of acid added) is noted at the stoichiometric point. This is also the case when an amino acid is similarly titrated. C. V. B.

The grading of collodion membranes by means of ethylene glycol. Ada M. Field and Arthur W. Thomas. Columbia Univ. *Proc. Soc. Exptl. Biol. Med.* **25**, 679(1928); cf. Pierce, *C. A.* **22**, 604.—Description is given of mechanisms involved in grading collodion membranes by means of ethylene glycol and the alc. retained in the membranes after 24 hrs., drying. C. V. B.

A device for determining refractory period of the mammalian heart during normal sinus rhythm. Harold A. Wheeler and E. Cowles Andrus. John Hopkins Univ. *Proc. Soc. Exptl. Biol. Med.* **25**, 695–6(1928).—An app. is described which utilizes the action current after amplification, and with which it is possible to interrupt the sinus rhythm at any interval following a normal excitation. C. V. B.

Extraction of ovarian hormone from urine. C. D. Veler and Edward A. Doisy. St. Louis Univ. *Proc. Soc. Exptl. Biol. Med.* **25**, 806–7(1928).—A method is described for extn. and purification of the ovarian hormone from urine. This hormone is ex-

creted during pregnancy, and this elimination appears to cease soon after delivery.
C. V. B.

Determination of stercobilin. A. BAREGGI. *Folia clin. chim. micro.* **1**, 194-7 (1926).—According to Pietra and Bozzolo (*C. A.* **19**, 2965), stercobilinogen may be detd. by mixing 1 g. of the feces with 50 cc. of 95% alc., treating with an oxidizing agent (5-6 drops of HNO_2-HNO_3 and 11-12 drops of Obermeyer's reagent) to complete the transformation of stercobilinogen into stercobilin, and heating the liquid to the b. p. for 30 min. Of the clear decanted ext. 1 cc. is employed for the detn. by the fluorescence method, Nencki's reagent being used. B. considers that this method does not give accurate results and that it may be vitiated by the presence of bilirubin. Use of the spectroscopic method is recommended, the liquid being continuously dild. with alc. until the characteristic absorption band of stercobilin disappears, and it is considered advisable to take 5 g. instead of 1 g. of the sample. The Riva-Zoia method, in which chloroform is used for extg. the feces, gives results about one-half of those furnished by the Pietra and Bozzolo method, but serves well for ordinary clinical purposes. B. C. A.

The determination of heart-stroke-volume by means of ethyl iodide. GUNTHER LEHMANN. Kaiser-Wilhelm-Inst. für Arbeitsphysiol., Berlin. *Arbeitsphysiol.* **1**, 114-29(1928).—In studying the method of Henderson and Haggard (cf. *C. A.* **19**, 3506) it was found that EtI was sol. in water and was absorbed by rubber tubing. The air current in which the subject respired was drawn through a glass tube by a pump and the EtI vaporized from a glass container by positive pressure. The iodide in the expired air and alveolar air was absorbed by an aq. soln. of $AgNO_3$ and weighed as AgI (method of Ziesel). As the author considered he obtained too high values, he then detd. the distribution coeff. by means of an artificially perfused heart-lung prepn. from cats or rabbits, using blood at first, and later, horse plasma. The av. coeff. was 3.8. The value for plasma was the same by an *in vitro* method, and for blood between 5.5 and 8.5. Since EtI was not completely decomposed by blood, it is not suitable for the detn. of heart-stroke-vol. T. M. CARPENTER

A colorimetric method for the determination of methylglyoxal, dihydroxyacetone and glyceraldehyde. ERICH BAER. Kaiser-Wilhelm-Inst. für Arbeitsphysiol., Berlin. *Arbeitsphysiol.* **1**, 130-5(1928).—The method of Mendel and Goldscheider (cf. *C. A.* **19**, 3504) was applied to the detn. of methylglyoxal, dihydroxyacetone and glyceraldehyde. The 3 substances were detd. with sufficient accuracy in a concn. to 4 mg. % or 0.02 mg. absolute. T. M. CARPENTER

The influence of phenol and of formaldehyde on the preservation of some biological reagents. PIETRO RINALDI AND NICOLA SETTE. *Annali igiene* **37**, 446-61; *Chem. Zentr.* **1927**, II, 1735.—A study of the effect of PhOH and of HCHO on sheep blood corpuscles, hemolysin, complements, antigens, vaccines, agglutinins and sera showed that PhOH is preferable in every way to HCHO as a perserving agent. Even PhOH, however, impairs the stability of the action of antibodies. C. C. DAVIS

Has the addition of sodium citrate an influence on the customary carbon monoxide tests? HEINZ KOCKEL. Universitätsinstitut gericht. Med. in Innsbruck. *Wiener klin. Wochschr.* **41**, 1310-1(1928).—The addn. of enough Na citrate to prevent clotting had no effect on tests for CO. D. B. DILL

A simple and practical method of preserving anatomical specimens. ROBERTO MAGNANIMI. Univ. Pavia. *Arch. farmacol. sper.* **45**, 92-5(1928).—The method consists simply in suspending a wad of absorbent cotton satd. with $CHCl_3$ in the jar or container in which the anatomical specimen is to be preserved. The external form, color and histological structure of the specimen remain unaltered for a considerable time. A. W. DOX

Modification of the Widmark micro-method of determining alcohol in the blood. A. GALAMINI AND L. BRACALONI. Univ. Rome. *Arch. farmacol. sper.* **45**, 97-112 (1928).—The modification consists essentially in the use of a flask to the stopper of which is attached a rod terminating in a container for the sample and carrying a holder for the 0.1 cc. micro-pipet. In the bottom of the flask is placed 1 cc. 0.01 *N* $K_2Cr_2O_7$ in H_2SO_4, the stopper put in place and the flask heated 2 hrs. in a water bath at 55-60°. The EtOH thus evapd. from the sample reacts with the $K_2Cr_2O_7$ and the excess of the latter, after diln. with H_2O, is detd. by adding KI and titrating with $Na_2S_2O_3$. A. W. DOX

A color reaction for creatine and urea. EMILIO PITTARELLI. *Arch. farmacol. sper.* **45**, 173-6(1928).—The Weyl reaction for *creatinine* is an evanescent red color produced by addn. of Na nitroprusside. In the presence of an oxidizing agent, prefer-

ably $Na_2S_2O_4$, *creatine* on the other hand gives a permanent color. This reaction is sensitive 1:50,000. The color is stable to alkali, but is destroyed by acid and then only partially restored by again making alk. It is insol. in org. solvents and is not pptd. by salts of heavy metals. It is stable to oxidizing agents but destroyed by reducing agents. To perform the creatine test, make 5 cc. of the sample strongly alk., add about 0.05 g. Na nitroprusside and 0.1 g. $K_2S_2O_8$. A red color appears after 20–30 sec. and reaches its max. intensity in 2–3 min. If an instantaneous reaction is desired add a trace of $K_3Fe(CN)_6$. Creatinine and creatine may be identified in a mixt. of the 2. The evanescent Weyl reaction indicates the former, and the subsequent restoration of color by addn. of $K_2S_2O_8$ indicates the latter. Urea gives a similar reaction which is sensitive only 1:500, a concn. greater than that encountered in body fluids other than urine. A. W. Dox

A modification of the phenolized gelatin technic for the mounting of microscopic preparations of yeasts and algae. H. Kufferath. *Rev. hyg. med. prev.* **50**, 638–40 (1928).—A formula consisting of 7 g. gelatin dissolved in 42 cc. H_2O, 50 cc. glycerol and 1 g. phenol. To this melted mixt. add 0.3–0.5% $Cu(C_2H_3O_2)_2$, filter while hot. The $Cu(C_2H_3O_2)_2$ is for the purpose of retaining the natural green colors of the prepns. C. R. Fellers

The effect of preliminary treatment (fixing fluids) on staining properties of the tissues. A. V. Tolstoouhov. *Stain Tech.* **3**, 49–56(1928).—Staining properties depend primarily on the chem. compn. of the tissues. By applying mixts. to tissues of basic and acid dyes such as methylene blue and eosin Y, at different p_H values, differences in the isoelec. points of the nuclei and cytoplasm of different tissues were found. Many fixing fluids gave very stable compds. with tissue proteins and thus permanently changed, in many cases, the chem. compn., *i. e.*, staining properties, of the tissues. An example is the reaction of CH_2O with NH_2 groups of the amino acids of proteins; this makes the tissue proteins more acid, that is, it moves the isoelec. point of the proteins toward a lower p_H value. The same is true of polybasic acids. Bivalent heavy metals such as Hg combine with COOH groups and move the isoelec. point of the proteins toward a higher p_H. C. R. Fellers

A spectrophotometric method of studying hemoglobin and other colored substances in solution. George E. Davis. Ia. State Coll., Ames. *Proc. Iowa Acad. Sci.* **34**, 279–80(1927); cf. *C. A.* **21**, 3638.—An investigation was carried out to det. the possibilities of applying spectrophotometric methods to the problem of estg. the concn. of hemoglobin in blood. The concn. of a substance in soln. can easily be detd. from its transmission of some particular wave length, providing the absorption ratio for that wave length is known. A late model direct-reading spectrophotometer was used. The method was found to be fairly accurate and simple and should prove valuable in other phys. investigations involving the study of spectral transmission curves of various colored substances. Some interesting irregularities in the shape of the spectral transmission curve in one of the absorption bands of oxyhemoglobin were observed. W. G. Gaessler

A comparison of the quantitative methods for the bilirubin of the blood. H. F. Shattuck, J. A. Killian and M. Preston. *J. Lab. Clin. Med.* **12**, 802–10(1927); *Physiol. Abstracts* **12**, 561.—Parallel detns. of serum bilirubin were made in 150 cases showing varying degrees of jaundice by the icterus index of the blood serum and the modified quant. van den Bergh method. The detn. of the icterus index was the more reliable, the van den Bergh technic being unsatisfactory in 50% of the cases within the zone of latent jaundice. H. G.

Micro-method for the colorimetric determination of urea in blood. Florence Beattie. Queen's Univ., Belfast. *Biochem. J.* **22**, 711–2(1928).—0.5–1.0 cc. of blood is deproteinized. To 1 vol. blood add 7 vols. distd. water, 1 vol. 10% Na tungstate and 1 vol. $^2/_3$ *N* H_2SO_4. Shake and filter. Place 1 cc. filtrate (= 0.1 cc. blood) in a centrifuge tube, add 1 cc. glacial acetic acid and 0.2 cc. of 5% xanthhydrol in MeOH, allow to stand 5 min., stir, allow to settle for $^1/_2$–1 hr. or centrifuge for 20–30 min. Filter by suction using a Gooch crucible. Wash alternately 3 times with 2 cc. CH_3OH and distd. water. Place a small receiving tube inside the flask to catch the succeeding filtrate. Pour 5 cc. 50% H_2SO_4 into a crucible. When the ppt. has dissolved, attach the pump and draw the yellow soln. into a receiving tube. Wash with 4 cc. H_2SO_4. Remove the tube and make up to 10 cc. in a graduated test-tube. Compare in a colorimeter with standard. (The standard is made by dilg. 0.4 cc. of 0.01% urea with water. Then adopt a procedure as in blood filtrate—1 cc. urea, 1 cc. acetic acid, 0.2 cc. of 5% CH_3OH soln. of xanthhydrol. The ppt. is centrifuged, filtered, washed, and dissolved in 10 cc. of 50% H_2SO_4.) The standard corresponds to 0.04 mg. urea in the 10 cc. of acid

used. Calcn.: $10/x \times 40$ = mg. urea per 100 cc. blood, where the standard is set at 10 mm. and x = length of the column of soln. of unknown. BENJAMIN HARROW

Vital staining of normal and malignant cells. I. Vital staining with trypan blue and the cytoplasmic inclusions of liver and kidney cells. R. J. LUDFORD. Univ. London. *Proc. Roy. Soc.* (London) B103, 288–301(1928).—When animals are stained intravitally by means of trypan blue, cells of the liver and kidney contain dye droplets assocd. with the mitochondria and Golgi app. No definite relationship apparently exists between the droplets and mitochondria. The droplets appear in relationship with the Golgi app., and break loose into the cytoplasm when formed; this procedure resembles the formation of secretion granules in gland cells. These findings suggest the functional relationship between mitochondria and Golgi app. Syntheses by enzymes occur at the mitochondrial-cytoplasmic surface; the resulting products diffuse into the cytoplasm and are concd. at the surface of the Golgi app. preliminary to their elimination from the cell. JOSEPH S. HEPBURN

Colorimetric determination of blood pigment in comparison with the value obtained by determination of the oxygen capacity of the blood. JAROSLAV MĚLKA. Komenský Univ., Bratislava. *Bratislav. Lekárske Listy* **6**, 113–22(1926).—Blood pigment was detd. in 2 ways: (1) calcd. from the O_2 capacity detd. by Barcroft's differential manometer, using venous blood, and (2) by the usual colorimetric method, using capillary blood. The values obtained colorimetrically were always lower than those calcd. from O_2 capacity, the differences being smaller when venous blood was used for both tests. Conclusion: The lower values in the colorimetric test are due in part to admixt. of tissue lymph with the blood. WILLIAM J. HUSA

New method for identification of insoluble blood. FRANCESCO PISANI. *Boll. chim. farm.* **67**, 449–51(1928). See *C. A.* **22**, 2584. MARY JACOBSEN

Urinalysis in general practice. HENRY A. ELLIS. *Am. Med.* **34**, 447–56(1928).—Discussion. FRANCES KRASNOW

Determination of quinine in blood. M. M. PANTSCHENKOW AND A. A. KIRSTNER. Med. Klinik der I Staats-univ. in Moskau. *Arch. Schiffs-Tropen-Hyg.* **32**, 137–40 (1928).—The ether ext. is treated with 1–2 cc. dil. H_2SO_4, warmed slightly, set in the light of a Bachschen quartz lamp and the resulting fluorescence matched against a quinine bisulfate standard treated in the same way. FRANCES KRASNOW

Is a chlorophyll-free diet necessary for the study of occult blood? Z. ERNST, B. V. PURJESZ, JR. AND L. ZILZER. *Arch. Verdauungs-Krankh.* **42**, 209–10(1928).—Chlorophyll has little influence on most of the blood reactions. Green plants as well as meat and fish affect the benzidine reaction and they should be omitted from the test diet. FRANCES KRASNOW

The repeated test-breakfast method in the study of the functions of the gastric cells. S. REISELMAN. Ukrainischen Staatsinstitut der Arbeitsmedizin. *Arch. Verdauungs-Krankh.* **42**, 211–24(1928). FRANCES KRASNOW

Liver-function test with "Bengalrot." I. SNAPPER AND S. C. M. SPOOR. *Arch. Verdauungs-Krankh.* **43**, 426–8(1928).—100 mg. "Bengalrot" in 10 cc. water (1.5 mg. per kg. body wt.) is injected intravenously and the patient kept in the dark. After 1 hr. a blood sample is obtained, oxalated, and centrifuged. After the addn. of a few drops of NaOH soln., a spectroscopic reading is taken. With the normal liver a 1:300,000 Bengal red value is obtained after 1 hr. Higher values indicate liver dysfunction. FRANCES KRASNOW

Improved procedure for the extraction of the ovarian hormone. II. Some corrections and additions. SIDNEY THAYER, C. N. JORDAN AND EDWARD A. DOISY. St. Louis Univ. *J. Biol. Chem.* **79**, 53–64(1928); cf. *C. A.* **20**, 3301.—In the prepn. of ovarian hormone care must be taken that the Et_2O and petroleum ether used in extns. contain no peroxides as destruction of the hormone by oxidation can readily occur. Storage of the hormone in solvents which may develop peroxides must also be avoided. The conversion of an alc. soln. of the hormone into a crystal-clear aq. soln. is a simple matter and is accomplished by merely dilg. it with an appropriate vol. of H_2O and distg. off the alc. The colloidal impurities are coagulated by addn. of a drop of dil. HCl followed by filtration through a thick layer of asbestos after several hrs. in a refrigerator. Details of the complete process of extn. are given. A. P. LOTHROP

Composition of bone. I. Analytical methods. M. J. SHEAR AND BENJAMIN KRAMER. Jewish Hosp., Brooklyn, N. Y. *J. Biol. Chem.* **79**, 105–20(1928).—With the methods described the CO_2 content of bone can be detd. with 20 mg. of bone powder and duplicate detns. of Ca and inorg. P require only 10 mg. The CO_2 content of the bone after extn. with an alc.-Et_2O mixt. is detd. in the Van Slyke manometric blood gas app.; the CO_2 is liberated by H_2SO_4 and detd. by absorption with alkali. For the

Ca and P detns. the bone powder is digested with HCl and the protein removed with CCl_3CO_2H; the Kramer and Tisdale procedure is used for estg. Ca and the Briggs-Bell-Doisy method for the P. These procedures were developed to permit the analysis of very small specimens of calcified tissues but they may also be used for detg. CO_2, Ca and P in solids other than bone. A. P. LOTHROP

The oxidation of dixanthydryl urea, a micro-method for determining urea. JAMES M. LUCK. Stanford Univ. *J. Biol. Chem.* 79, 211–9(1928); cf. *C. A.* 22, 2763.—A volumetric method for the estn. of urea is described in which the urea is pptd. as dixanthydryl urea. This compd. dissolves in H_2SO_4 to give a fluorescent yellow soln. which can be quant. titrated with $KMnO_4$. The method can be used with the H_2WO_4 blood filtrate, with urine, and with tissue exts. and 0.1 mg. of urea may be estd. with an exptl. error of about 5%. A. P. LOTHROP

A study of the estimation of chloride in blood and serum. D. WRIGHT WILSON AND ERIC G. BALL. Univ. of Pa. Med. School. *J. Biol. Chem.* 79, 221–7(1928).—More accurate and consistent results are obtained with the Van Slyke method (*C. A.* 18, 698) for chloride in blood or serum if aq. $AgNO_3$ soln. and HNO_3 are added separately instead of a soln. of $AgNO_3$ in HNO_3. A. P. LOTHROP

A comparison of p_H determinations as obtained by means of hydrogen electrode and colorimetric methods. CHARLES G. JOHNSTON. Univ. of Pa. Med. School. *J. Biol. Chem.* 79, 297–307(1928).—Cullen's, Hasting's modification of Cullen's, and Dale and Evans' colorimetric methods were compared with the H_2 electrode method in detg. the H-ion concn. of dog sera. The differences between the 2 types of methods were not const. and the corrections necessary were so variable that the colorimetric methods cannot be used if accurate comparisons of even individual detns. are to be made. It is doubtful if colorimetric methods should be used indiscriminately on all varieties of sera without adequate checking with the H_2 electrode. They should not be employed for a comparison of individual detns. of either human or dog bloods. They may be used for statistical studies on human blood from normal and certain groups of pathol. individuals with av. correction values. A. P. LOTHROP

The volume of the blood. I. The use of the thermocouple for determining the freezing point of a small quantity of fluid. DAN C. DARROW AND THOMAS E. BUCKMAN. *Am. J. Diseases Children* 36, 78–82(1928).—A thermoelec. method for the detn. of the f. p. of biological prepns. is described. Not more than 3 cc. quantities of fluid are required. The method is rapid and accurate within 0.004°. E. R. M.

A critical study of the portable Benedict apparatus. LUCIEN DAUTREBANDE. *Arch. intern. med. exptl.* 4, 327–34(1928).—A brief report of D.'s investigation of possible sources of error attending the use of the portable Benedict app. for the detn. of metabolic rate. E. R. MAIN

The reaction of the blood in sex determination. The significance of the permanganate mixture in the chemistry of the sex determination reaction. V. V. PRÁVDICZ-NEMINSKII. *Biochem. Z.* 192, 303–23(1928).—The Nanoilow reaction was performed only with the reagents without blood or any other fluid. By varying the amt. of HCl all gradations were obtained from the typical male reaction (complete discoloration) to the typical female reaction. This change is attributed to the actual formation of ozone and Cl_2 in the mixt. The former can be easily demonstrated when 3 drops of 9.52% HCl are mixed with 20–30 drops of 1% $KMnO_4$, by the blackening of a Ag plate, while the Cl_2 liberated can be detected by its characteristic odor or with $AgNO_3$. Thiosinamine is easily oxidized by $KMnO_4$. It easily binds the ozone and Cl_2 and thus promotes the reaction to completion. Dahlia is relatively stable to oxidation and is but very slowly acted upon by 0.1 *N* $KMnO_4$. But the $KMnO_4$-HCl mixt destroys the dye rapidly with formation of ozone and Cl_2 in the absence of org. substances, or when their concn. is relatively low. Thus, the "typical male reaction" of Nanoilow is produced. In the presence of easily oxidizable substances the dye is protected from oxidation and the "female reaction" results. It is not surprising, therefore, that sperm and spermin give the "female" reaction while it is not obtained with "ovarin." Their ability to prevent discoloration depends on their ability to become oxidized. The Nanoilôw reaction cannot therefore serve to identify directly the sex hormones. S. MORGULIS

Iodometric micro-determination of nitrogen by means of alkali hypobromite. TORSTEN THORELL. *Acta med. Scand.* 68, 305–35(1928).—Nothing new. The importance of a properly adjusted alky. for accurate results by the procedure is emphasized. S. MORGULIS

An iodometric method for determining homogentisic acid in urine. ERNST METZ. *Biochem. Z.* 190, 261–4(1927).—The detn. depends upon the oxidation of homogentisic acid to quinoneacetic acid by I in an alk. medium. The reaction is reversed in acid

soln. and the I set free by acid is titrated back with 0.1 N $Na_2S_2O_3$. The detn. is carried out as follows: to a soln. of homogentisic acid made alk. with $NaHCO_3$ or borax add 0.1 N I soln. until the blue reaction with starch is obtained. Acidify with dil. H_2SO_4 and titrate the I. Each cc. 0.1 N $Na_2S_2O_3$ corresponds to 8.487 mg. dry homogentisic acid, or 0.10 g. acid equals 11.783 cc. 0.1 N $Na_2S_2O_3$. In working with alkaptonuric urines 1–10 cc. is accurately measured and dild. with water to 10 cc. where necessary. This is made alk. as before. Add 1 cc. 1% starch soln. as indicator, and titrate with I. The acid should be added cautiously, and the foam may be broken with a little alc. S. MORGULIS

The use of Stolte's ashing method in microanalysis. CARLA EGG AND K. KLINKE. Physiol.-Chem. Anstalt, Univ. Basel. *Biochem. Z.* 191, 439–41(1928).—Stolte's method for ashing biological material gives absolutely reliable results also in the microanalysis of bases (Na, K). For the detn. of P, Cl and S the wet ashing method must still be used. S. MORGULIS

Biochemical preparation of a diglucide-monophosphoric ester. C. NEUBERG AND J. LEIBOWITZ. *Biochem. Z.* 193, 237–44(1928).—Under the influence of the lactic acid organism, *Bacillus Delbrücki*, a substance with a high sp. rotation (+55°) is produced which as the Ba salt has the composition: $C_{12}H_{21}O_{10}.PO_4Ba$, *i. e.*, a monophosphato ester of a diglucide. It is suggested that this is formed through the complete de-phosphorization of one and partial de-phosphorization of another of 2 mols. of hexose-diphosphate. It is known that enzymically both glucose and fructose may be formed from the hexose-diphosphate ester, and while in the nascent state these apparently combine into a diglucide. S. MORGULIS

A rapid method for determining organically bound iodine. G. PFEIFFER. *Biochem. Z.* 195, 128–33(1928).—The org. matter is digested with H_2SO_4-H_2O_2 whereby the I set free is collected in alkali. The oxidation does not require very high temp. so that there is little H_2SO_3 formed and therefore the alkali is not readily used up. Also there is no danger of HIO_3 formation since this is at once reduced to HI by the H_2SO_3 present in the digestion mixt. The detn. is very much simpler than the alkali hydrolysis usually employed and requires only about 40 min. and as much as 100 g. of substance can be worked over. The distillate is now neutralized with H_2SO_4 and filtered into a 250 cc. sepg. funnel. According to the amt. of I_2 expected, $CHCl_3$ is added, 1 cc. for every 200–300 γ (0.001 mg.), and a few cc. HNO_2 and the liberated I_2 is extd. by shaking. 100 γ I_2 can be very easily recognized in 10 cc. $CHCl_3$. The detn. is then carried out on 0.05–0.10 cc. amts. of the $CHCl_3$ by v. Fellenberg's colorimetric method. S. MORGULIS

Electrodialysis of serum. G. ETTISCH AND W. EWIG. *Biochem. Z.* 195, 175–88 (1928).—Fractionation of the serum globulin by electrodialysis should be carried out under the following conditions: undild. serum must be employed; large changes in reaction must be avoided; the temp. should be maintained below 36°; the fractionation should be carried out rapidly. The procedure is discussed for attaining these ideal conditions. Also, the use of an albumin-collodion membrane for the anode together with a parchment membrane is described, the former not being replaceable by a simple collodion membrane. S. MORGULIS

Urea determination in urine. MAX HOPF. *Biochem. Z.* 195, 206–9(1928).—Criticism of the urease method as recommended by Pincussen. The results are too low because of the failure to distil off the entire amt. of NH_3 in the prescribed time. By prolonging the distn. up to 50 min. results were obtained which checked well with Laubender's modification of Folin's $MgCl_2$ method for urea detn. S. MORGULIS

A new method for estimating the digestive action of enzymes according to the effect on elastin. JOSEF SCHNEIDER, JR., AND AUGUSTIN HÁJEK. Inst. of Tanning, Prague. *Biochem. Z.* 195, 403–14(1928).—Elastin is obtained from Ligamentum nuchae. The influence on the tryptic digestion of elastin of H-ion concn., duration of digestion, the size of elastin particles, temp., variable amts. of enzyme or of elastin was detd. S. MORGULIS

Micro-determination of non-protein nitrogen in blood by the sodium hypobromite method. RYUZO IWATZURU. Med. Akad., Osaka. *Biochem. Z.* 195, 442–8(1928).—This method does not present anything new, except that the use of Na tungstate in place of $CuSO_4$ is recommended in carrying out the digestion with acid. S. M.

The colorimetric determination of levulose in blood by means of diphenylamine. PAUL RADT. Krankenhaus Moabit, Berlin. *Biochem. Z.* 198, 195–203(1928).—One cc. of defibrinated blood or serum is added in a test tube to 1 cc. 4% HCl; then, with vigorous shaking, 2 cc. of 5% $HgCl_2$ are added. A protein-free filtrate is thus obtained, of which 0.5 or 1.0 cc. is used. For comparison 1 cc.

of 0.1% standard levulose soln. is taken. To each test tube are added 1 cc. 25% HCl and 0.1 cc. of a 20% alc. soln. of diphenylamine, and these are placed for 15 min. in a boiling water bath. After cooling 2 min. in water 1 and 5 cc. of amyl alc. are added to the standard and unknown tube, resp. The complete soln. of the ppt. in the amyl alc. is brought about by warming for 3 min. at 75°; after renewed cooling in water 1 and 5 cc. amyl alc. are again added, and following thorough mixing the colorless liquid under the alc. layer is carefully pipetted off. The inequality of color, the blood tube having a greenish tinge, can be corrected by the use of a filter under the colorimeter, for which purpose eosin is most suitable. It is stated that the results obtained by this procedure are qualitatively accurate. S. MORGULIS

Modification of the Salkowski reaction for the determination of cholesterol in blood serum. DORIS ABRAMSOHN. Inst. of Medicine, Leningrad. *Biochem. Z.* **198**, 233–40(1928).—The Krastelewsky modification of the Salkowskii reaction can be carried out at room temp. The phase of the yellow-orange coloration lasts 20–40 min., depending on the amt. of cholesterol, the end of this phase being marked by the appearance of a rose tone. This change in color is not due to the presence of H_2O. The best results are obtained with H_2SO_4 of sp. gr. 1.836. At the time of max. development of color intensity there is a state of equil. and passage from one layer to another is practically excluded, which insures the stability of the colorimetric tone. S. M.

A study in the variable factors in the use of Wright's stain. ROY F. FEEMSTER. Tulane Univ. *Ann. Internal Med.* **2**, 289–93(1928).—Distd. water is usually acid and should be buffered. Usually 30 cc. of 1% KH_2PO_4 and 20 cc. of 1% Na_2HPO_4 to a l. of distd. water are adequate. If the erythrocytes are too pink add more Na_2HPO_4, if not pink enough add more KH_2PO_4. The proper % of alc. in soln. 2 is 85 to 90. In old stains the concn. of pigment in soln. 1 may be too great. If so it will overstain with eosin. The staining time should not be less than 1 min. J. T. M.

The usefulness of the indole determination method of Kovács. E. LEHR. Staatlichen Veterinär-untersuchungsamt Potsdam. *Centr. Bakt. Parasitenk. Orig. I Abt.* **108**, 209–12(1928); cf. *Centr. Bakt. Parasitenk. I Abt. Ref.* **88**, 430(1928).—The superiority of the method does not hold in all cases, especially if only small quantities of indole are present. JOHN T. MYERS

The Ellermann method of granule staining. JOHANNES FIBIGER. Univ. Kopenhagen. *Folia Haematol.* **36**, 390–4(1928).—The method is useful in studying hyper- and metaplastic bone marrow or spleen, but care must be used and each specimen stained repeatedly, as the results are not always uniform. JOHN T. MYERS

A respiration apparatus for a metabolic study of the various subdivisions of the human race. FRANCIS G. BENEDICT. *Chinese J. Physiol. Report Series* **1928**, No. 1, 39–58.—The subject breathes through a rubber mouthpiece into a closed circuit of O-rich air. This closed circuit consists of a closed metal can, partly filled with soda-lime for the absorption of the CO_2 produced and covered with a light-wt. rubber bathing cap for the expansion and contraction of the air during respiration. The O consumed is replaced by O from a rubber bag. The O is satd. with water vapor by being passed through a moistening device. It is then metered through a pump of known and const. vol. of stroke. The expt. begins and ends with the bathing cap at a definite degree of distension, and the O introduced during the expt. is thus a measure of the O consumed by the subject. A simple O generator is described, with which O may be generated from a com. prepn. of Na_2O_2, when it is impossible to obtain cylinders of the compressed gas. But 2 measurements are needed, the no. of the pump strokes used in the expt. and the actual time elapsed. Details for testing the app. for tightness and for conducting a measurement are given. L. W. RIGGS

Different behavior of certain biliary acids in the classic color reactions. LOUIS CUNY. *Compt. rend. soc. biol.* **99**, 613–5(1928).—The Pettenkoffer reaction and its variants, performed in the usual manner, detect the biliary acids of the cholalic series which predominate in human bile. In the colorimetric estn. of biliary acids in general biology, account should be taken of other acids, such as desoxycholic, anthropodesoxycholic, hyoglycodesoxycholic and α-hyoglycocholic, which give fainter colors or none with this reaction. L. W. RIGGS

Method of testing liver functioning by means of Congo red. YOSHISHIGE NINOMIYA. *Tohoku J. Exptl. Med.* **11**, 151–87(1928).—The Congo red test is the best of the color tests for detg. liver functioning. Intravenous injections of Congo red in patients with liver disease, or in animals with experimentally damaged livers, were eliminated more slowly than in healthy subjects. The Congo red test is recommended for clinical use. **Relation of the reticulo-endothelial system to the functional liver test with Congo red.** *Ibid* 188–204.—In this and together with the preceding paper

substituted for 2 hydrogens on the phenyl group, toxicity is reduced. Introduction of the NH_2 group does not so markedly reduce toxicity as it prolongs the induction period, apparently a period of time when the substance is penetrating the cell. Organisms desiccated in strong sugar soln. show this effect well. Bacteria taken during the lag period or late during the phase of death show greater susceptibility to the action of germicides than cultures in the late logarithmic or max. stationary phase.
W. G. Gaessler

The use of sodium taurocholate and crystal violet in the isolation of Bacterium tumefaciens Sm. & Towne. M. K. Patel. Ia. State Coll., Ames. *Proc. Iowa Acad. Sci.* **34,** 88–89(1927).—Melt 15 g. of agar in 1000 cc. of distd. H_2O. Add 3 g. of sodium taurocholate, 10 g. of peptone and boil until well mixed. Add 20 g. of dextrose and adjust to p_H 7.0. Add 2 cc. of 1–1000 (aq.) crystal violet and make up to 1000 cc. Filter through cotton until clear. Tube and sterilize in an autoclave for 15 min. at 15 lb. pressure.
W. G. Gaessler

A substitute for beerwort as a yeast medium in the bacteriology laboratory. John C. Weldin. Iowa State Coll, Ames. *Proc. Iowa Acad. Sci.* **34,** 89–90(1927).—A liquid medium in which yeasts produce abundant gas is: malt ext. (Difco) 15 g., K_2HPO_4 1 g., NH_4Cl 1 g., distd. H_2O 1000 cc. The medium is adjusted with citric acid to p_H 5.4–5.6. A solid medium on which yeasts grow vigorously is: malt ext. (Difco) 15 g., K_2HPO_4 3 g., NH_4Cl 1 g., agar 20 g. (amt. of agar, however, optional). The medium is adjusted with citric acid to p_H 5.4–5.6.
W. G. Gaessler

Relative costs of home-made and dehydrated nutrient agar. Max Levine. Ia. State Coll., Ames. *Proc. Iowa Acad. Sci.* **34,** 91(1927).—Batches of 1, 4, and 7 l. of nutrient agar were prepd from the ingredients according to standard methods, and the costs compared with those of similar batches made from com. dehydrated nutrient agar. The costs of ingredients, labor, and loss due to filtration were the only items considered. It was found uneconomical to prep. nutrient agar from its constituents in batches of less than 2.5 l. with labor at 40c an hr. (about $80.00 per month). The higher the cost of labor, the larger the batch of agar that would have to be made to have costs compare favorably with the use of commercially dehydrated nutrient agar.
W. G. Gaessler

Influence of bile and brilliant green on rate of growth of colon bacilli. Harold W. Coles and Max Levine. Ia. State Coll., Ames. *Proc. Iowa Acad. Sci.* **34,** 92 (1927).—Evapd. bile may inhibit or stimulate growth of colon bacilli depending on concn. of bile, reaction of the medium, and the strain of organism employed. With all samples of bile employed a concn. of 2.0% accelerated growth whereas 5.0% was inhibitory in acid media (about p_H 6.0), and stimulating in alk media (p_H 7.3–7.8). With 2.0% dried bile concns. of more than 1–50,000 brilliant green distinctly retarded growth, and with 5.0% evapd. bile concns. of 1–20,000 or less of the dye were not considered inhibitory.
W. G. Gaessler

Some observations on the germicidal efficiencies of alkalies. Max Levine, J. H. Buchanan, Grace Lease and E. E. Peterson. Ia. State Coll., Ames. *Proc. Iowa Acad. Sci.* **34,** 93(1927).—For a given alkali, the germicidal efficiency increases with decreasing H-ion concn. but the H-ion concn. is not suitable as an index of the germicidal powers of different alkalies. The addn. of various salts to NaOH increased the germicidal effects of the alkali.
W. G. Gaessler

Some errors in the use of physicochemical concepts in physiology of bacteria. R. E. Buchanan. Ia. State Coll., Ames. *Proc. Iowa Acad. Sci.* **34,** 94(1927).—(1) A confusion of terms leads to the fallacious conclusion that the chance distribution of resistances of microörganisms to lethal agencies justified the expectation that the survivors' curve should conform to the monomol. reaction curve. (2) Not only rates of growth and death of an organism depend upon phys. and chem. environment, but the position of the min., the optimum, and max. growth temps. as well. (3) There exists more or less confusion with reference to the application of the van't Hoff-Arrhenius equation and the evaluation of a temp const. (4) There have been fallacious interpretations of survivors' curves in terms of conformity to those typical of monomol., bimol. and trimol. chem. reactions.
W. G. Gaessler

The bactericidal action of the common phenols and some of their derivatives on Bacillus pestis. J. F. Cains. *Indian J. Med. Research* **15,** 117–34(1927); *Bull. Hyg.* **3,** 496(1928).—The bactericidal action of the following substances was studied (1) phenol, (2) phenol derivs., (3) phthaleins, (4) derivs. of fluorescein. Table of results and discussion of chem. constitution are included.
George R. Greenbank

The bactericidal action of some compounds of mercury on Bacillus pestis. J. F. Cains, S. A. Kamal and B. P. Naidu. *Indian J. Med. Research* **15,** 327–33(1927);

Bull. Hyg. **3,** 497(1928).—The mercurial compds. studied were phenols, red and blue trypan and acid fuchsin. *p*-Chloromercuriphenol was found to be inhibitory in dilns. of 1 to 320,000. The dyestuff derivs. had little influence. GEORGE R. GREENBANK

Studies on lactic acid streptococcus. KARL J. DEMETER. *Milchwirtschaft. Forsch.* **5,** 505–31(1928).—A study was made of the effect of temp., acidity, fat content of milk, chem. stimulants and physiol. nutrition, upon the coagulation and reduction potential of milk cultures, by this group of organisms. GEORGE R. GREENBANK

A theory of the formation of zymase in the living cell. EGERTON C. GREY. Univ. Cambridge. *Proc. Roy. Soc.* (London) **B103,** 302–11(1928).—*B. coli communis* acts upon carbohydrates to produce either lactic acid fermentation or a modified alc. fermentation; a recent aerobic environment is prerequisite for the latter fermentation. Zymase is the surviving part of the respiratory mechanism; it is not readily formed under aerobic conditions, but is produced by a distortion of the normal respiratory mechanism which decreases as the enzyme is secreted. JOSEPH S. HEPBURN

Enzymes of Bacillus coli communis. VI. The alternative modes by which B. coli communis may bring about the anaerobic decomposition of glucose. EGERTON C. GREY. Univ. Cambridge. *Proc. Roy. Soc.* (London) **B103,** 312–20(1928).—Under anaerobic conditions, *B. coli communis* may produce (1) a combination of cleavage, oxidation and reduction, analogous to alc. fermentation by yeast, with the fundamental difference that HCOOH is formed instead of CO_2, or (2) a combination of cleavage and mol. stabilization. The latter is essentially a lactic acid fermentation; it supplies less energy to the cell, but is simpler and apparently less influenced by the reaction of the medium; hence it occurs when the vitality of the organism is low as the result of age, prolonged absence of O_2, and accumulation of toxic products. JOSEPH S. HEPBURN

The effect of arsenious acid on respiration and fermentation. II. KURT DRESEL. *Biochem. Z.* **192,** 351–7(1928); cf. *C. A.* **22,** 2618.—Glucose has a certain protective effect against the restrictive action of As_2O_3 on the respiration and fermentation by yeast. In the presence of KH_2PO_4 1% glucose caused a greater restriction by As_2O_3 than occurred in the absence of glucose. Sulfates of Fe, Mn, Co, Cu, Zn and Ni decrease respiration and fermentation in yeast, but when these have already been decreased by the action of 2×10^{-4} *M* As_2O_3, these salts produce little or no further change. E. H.

The resistance of Streptococcus fecalis to acid and alkaline media. A. W. DOWNIE AND J. CRUICKSHANK. *Brit. J. Exptl. Path.* **9,** 171–3(1928).—*Streptococcus fecalis* is resistant to exposure to very acid and very alk. media, and is easily obtained in pure culture by direct inoculation of feces into alk. broth p_H 11.0. H. F. H.

Cataphoresis experiments with the virus of vaccinia. S. R. DOUGLAS AND W. SMITH. *Brit. J. Exptl. Path.* **9,** 213–5(1928).—The virus of vaccinia carries a neg. elec. charge over a range p_H 5.5 to p_H 8.4. Cataphoresis at a H-ion concn. on the acid side of p_H 6.8 affords a means of sepg. the virus from tissue proteins. HARRIET F. HOLMES

The biochemical properties of diphtheria and so called pseudodiphtheria bacilli. W. H. DE WOLFF. *Nederland. Tijdschr. Hyg. Microbiol. Serol.* **3,** 38–70(1928).—The *Bacterium B of Hofmann-Wellendorf* decomposes *milk protein* energetically. The acid value decreases steadily after the 5th day. The formol titer rises, and the total N decreases, because of formation and loss of NH_3. The serum N increases and the curd N decreases with the age of the culture. The amino acid content rises. The protein decompn. is accompanied by a decrease in rotation, which must be attributed to the formation of *l*-rotatory decompn. products of protein, since lactose is not attacked. *Bacterium coli communis* and *Hofmann-Wellendorf A* do not attack milk proteins. *B. diphtheriae* and the *pseudodiphtheria bacilli* from the Lister and Krall collections practically do not attack milk protein. The former causes a slight increase in acidity; the latter decomposes *lactose* and curdles the milk. Several *diphtheroid bacteria* from the throat of chickens infected with bird or virulent human diphtheria attacked the protein slightly; the reaction varied from acid to neutral. MARY JACOBSEN

The silver-line system in ciliata. Further studies. BRUNO M. KLEIN. *Arch. Protistenk.* **62,** 177–260(1928); cf. *C. A.* **21,** 3210.—Staining ciliata with Ag salts outlines definite patterns of "argentophile" substance. FRANCES KRASNOW

A toxin-producing hemolytic streptococcus from septicemia. I. PILOT AND R. E. WESTLUND. *J. Infectious Diseases* **41,** 208–10(1927).—A strain of *Streptococcus hemolyticus* isolated from the blood of a patient with septicemia produced a toxin which resembles the toxin of streptococci of scarlet fever in skin reactions and in neutraliza-

tion tests with antitoxic serums. Agglutination reactions and absorption tests, however, failed to demonstrate a similar sp. relationship. Julian H. Lewis

Effect of surface tension on the growth of Escherichia coli. Wm. R. Albus. *J. Infectious Diseases* **41**, 211–4(1927).—When the growth of *E. coli* is expressed as a logarithmic curve it is found that pure Na ricinoleate reduces the no. of living organisms in the culture. The cell mortality does not take place until after the culture has passed through a normal logarithmic growth period. If the logs of the no. of cells are plotted against surface tension of the culture medium a straight line is produced which fact indicates that the mortality follows the surface tension of the medium and not the concn. of the soap as a depressant. Julian H. Lewis

Gas production by bacterial symbiosis with special reference to the influence of nitrogenous substances. Mitsuteru Ishikawa. Washington Univ. Med. School, St. Louis, Mo. *J. Infectious Diseases* 41, 238–56(1927).—The nonproteolytic, gas-forming bacteria alone cannot produce noticeable amts. of gas from carbohydrates and salts of formic acid in media contg. only complex nitrogenous substances as milk, ascitic fluid, casein, nutrose and gelatin, but gas is generated intensively by these bacteria in such media if they are grown in assocn. with the proteolytic bacteria, and demonstrable amts. of gas are formed if simple forms of nitrogenous substances—the digestion products of proteins, peptone, amino acids and NH_4 salts—are added to such media. The formation of gas from carbohydrates by the associative cultures of 2 kinds of saccharolytic bacteria, an acid-producing organism and a gas-forming bacterium, does not take place markedly in ascitic fluid, casein, nutrose and gelatin media, except under the following conditions: When a proteolytic organism is cultivated in assocn. with the 2 saccharolytic bacteria; or when simple nitrogenous substances—peptone, amino acids or ammonium salts—are added to the medium. The role played by the proteolytic bacteria in these cases is that they pave the way for the fermentative activity of the saccharolytic bacteria by breaking down the proteins of the media into simple forms of nitrogenous substances which are apparently necessary for the formation of gas. It is probable that such simple nitrogenous substances accelerate the activity or the production of the sp. enzyme, formiase, which is thought to be responsible for the production of gas. Many of the NH_4 salts, as the sole source of N, satisfy the bacterial requirements for growth and fermentative activity, but NH_4 benzoate and NH_4 salicylate are unsuitable for either of these requirements. J. H. L.

The growth of hemophilic bacilli with certain iron salts. Janet M. Bourn. Michael Reese Hospital, Nelson Morris Institute and Univ. of Chicago, Chicago, Ill. *J. Infectious Diseases* 41, 294–303(1927).—Certain hemophilic bacilli can be cultivated through successive transfers in veal infusion broth to which Na aquopentacyanoferroate has been added, whereas, homologous bacilli do not survive beyond the primary culture when the Fe salt is not present. In a chemically defined synthetic medium which contains the Fe salt, these hemophilic bacilli gave evidence of growth in the primary culture when an unwashed bacterial inoculum has been used, but this does not serve to initiate growth in a secondary culture. The evidence suggests that pentacyano Fe salts do not function independently as the X factor in bacterial nutrition, but that the biocatalytic activity observed is the result of an interaction between the inorg. Fe salt and some thermostable tissue deriv. from an animal source. J. H. L.

The optochin fastness of pneumococci. Claus W. Jungeblut. New York State Dept. of Health. *J. Infectious Diseases* 41, 345–54(1927).—Strains of type 1 pneumococci which had become adapted to optochin did not show cellular changes differing from the normal, nor was there any difference in the p_H of the cultures of the 2 types. Normal strains of pneumococci grown in the sterile filtrates of adapted strains may occasionally acquire an increased tolerance to optochin. This acquired adaptation does not seem to be assocd. with biologic changes in the organisms but with some unknown substance present in the active filtrates. Julian H. Lewis

Effect of Cl. sporogenes on toxin production by Cl. botulinum. E. Wagner Sommer and Kathryn Glunz. Univ. of Calif. Med. School, San Francisco. *J. Infectious Diseases* 41, 442–7(1927).—Spore suspensions of *Cl. botulinum* and *Cl. sporogenes* inoculated in varying relative amts. into meat, spinach and asparagus media, which are incubated for 10 days and tested for the presence of toxin, reveal botulinum toxin in all the meat cultures in which *Cl. botulinum* is present, irrespective of the no. of sporogenes. The inoculation of an equal or greater no. of *Cl. botulinum* with sporogenes is usually necessary for toxin production in spinach. In asparagus, a poorer toxin medium, a more deleterious influence of sporogenes on botulinum toxin was noted. In meat, spinach and asparagus media increasing nos. of sporogenes gradually diminish the strength of the toxin. Julian H. Lewis

The specificity of scarlet fever streptococci. S. I. Zlatogorov and V. S. Derkach. Bacteriol. Inst., Kharkov, Ukrainia, U. S. S. R. *J. Infectious Diseases* **42,** 56–65 (1928).—Streptococci derived from sources other than scarlet fever produce toxic substances (toxins). These substances cause a skin reaction of the Dick type under the same conditions as the toxins of scarlatinal streptococci. Substances producing the phenomenon of extinction (blanching test of Schultz-Charlton) may be obtained by immunization with scarlatinal as well as nonscarlatinal streptococci. A positive Dick reaction may be obtained during the period of scarlet fever complications with scarlatinal as well as nonscarlatinal streptococci. This is supposed to be a case of reaction to the unsp. bacterial proteins. Scarlatinal serums give the reaction of flocculation (pptn.) with toxins of streptococci derived from various pathogenic sources. Neither the toxin production nor the Schultz-Charlton test confirms the specificity of scarlet fever streptococci. Julian H. Lewis

Studies on the metabolism of the abortus-melitensis group. II. Further observations on nitrogen metabolism. James G. McAlpine and Charles A. Slanetz. Storrs Agr. Expt. Station., Conn. *J. Infectious Diseases* **42,** 66–71(1928).—*B. abortus* of bovine origin utilizes very little or no glucose in its metabolic activity. On the other hand *B. abortus* of porcine and human origin and *B. melitensis* consumed from 4 to 18% of this carbohydrate for growth energy. By this difference in sugar metabolism *B. abortus* bovine can be differentiated from *B. abortus* porcine and human, and from *B. melitensis* by the different amts. of the various N fractions present in the culture media over a 14-day incubation period. This difference is apparent only in glucose-contg. media. CO_2, 10%, stimulates the growth of *B. abortus* bovine, even though the strains may have become accustomed to aerophilic conditions, but it partially inhibits the multiplication of *B. abortus* porcine and human, and *B. melitensis.* This inhibition may be due to slight changes in H-ion concn. caused by the CO_2 and perhaps partly to a decrease in O supply in the closed, as compared with the open, culture system. **III. Glucose utilization.** *Ibid* 73–8.—Quant. sugar detns. made by the Somogyi and Benedict methods, and p_H detns. (colorimetric), when Fairchild's peptone is employed in the medium show that the *B. abortus-melitensis* group may be split into 2 main parts. The first of these includes all strains which are unable to utilize more than 2% of glucose. The 2nd group includes those which utilize 5–20% of the carbohydrate and is made up of *B. abortus* of human and porcine origin, and *B. melitensis.* These results were consistent with a large no. of strains, barring 1 exception. This was a bovine strain which showed 8–10% utilization. It is not unlikely that in some instances cows become infected with the porcine strain. All of the human strains were apparently more closely related to the porcine strains than they were to those of bovine origin. Julian H. Lewis

The successful cultivation of the gonococcus on blood-agar plates. Russell D. Herrold. John McCormick Inst. for Infectious Diseases. *J. Infectious Diseases* **42,** 79–83(1928).—Blood is more valuable as an enrichment for nutrient solid media for isolating gonococci if 0.75% to 1% agar is used. The value of this medium is further enhanced by the use of phosphate instead of NaCl and the addition of blood (10–15%) to the agar at 65° followed by gradual cooling to 45° before pouring into plates or slants. Nutrient solid media thus prepd. have proved valuable in isolating gonococci from both chronic and acute infections. Julian H. Lewis

Quantitative estimation of casein hydrolysis by Clostridium botulinum. Gail M. Dack and Willard L. Wood. Univ. of Chicago. *J. Infectious Diseases* **42,** 172–5 (1928).—*Cl. botulinum* will grow and produce toxin in a medium contg. casein and peptone. The peptone is first utilized for growth; after a secondary incubation period the casein is broken down and used in further growth and toxin production. The curve for the toxin titer shows a relationship to casein hydrolysis as indicated by the total N curve. Julian H. Lewis

The attenuation and toxin production of the diphtheria bacillus. 1. Attenuation of the diphtheria bacillus. 2. Synthetic media. 3. Factors affecting growth and toxin production. Augustus Wadsworth and Mary W. Wheeler. N. Y. State Dept. of Health, Albany. *J. Infectious Diseases* **42,** 179–208(1928).—In the synthetic medium of Uschinsky, attenuation of the diphtheria bacillus was obtained in 1 instance with complete loss of virulence and toxin production. Neither virulence nor toxin production could be restored by cultivation in media or animal passage. In a synthetic peptone medium free from meat infusion, containing only the chlorides, sulfate and phosphates of Na, Ca and Mg, with dextrose as a source of energy and peptone as a source of N, the diphtheria bacillus not only grew but produced toxin. A potent toxin, however, was obtained only when in the prepn. of this medium the Ca and phos-

phate ions were heated together in the presence of peptone. The calcium ions could be replaced by equiv. amts. of Ba or Sr but not by Mg or Mn. The addition of a small amt. of colloidal Ca phosphate to an infusion-free peptone medium, which, without the colloidal Ca-phosphate, was not favorable for toxin production, increased toxin production from 10- to 100-fold. The pptn. of Ca, however, from toxin after it had once been produced by the diphtheria bacillus, did not alter the potency of that toxin.

JULIAN H. LEWIS

The mechanism of toxin production by Clostridium botulinum. GAIL M. DACK AND WILLARD L. WOOD. Univ. of Chicago. *J. Infectious Diseases* **42,** 213-7(1928).—Supernatant fluid from a 48-hr. beef heart culture of *Cl. botulinum,* type A, when added to thymolized beef heart, egg white, and casein media, on incubation, showed the following changes: the toxin was much weakened but not completely destroyed; there was evidence of proteolytic activity. Similar results were obtained when the cell suspensions were added to thymolized beef heart medium. The toxin was completely destroyed in the thymolized cell suspensions and supernatant fluid in the absence of added protein media. JULIAN H. LEWIS

A new differential medium for the paratyphoid group. EDWIN O. JORDAN AND PAUL H. HARMON. Univ. of Chicago. *J. Infectious Diseases* **42,** 238-41(1928).—The compn. of the new medium is: agar 20 g., distd. H_2O 1000 cc., alc. soln. of phenol red (0.2%) 12 cc., Difco peptone 10 g., Na K tartrate 10 g., NaCl 5 g. On stab inoculation of this medium in tubes organisms of the *B. schottmülleri* group produce an alk. reaction (red) and those of the *B. aertrycke* group produce acid (yellow). The differentiation is definite and the ingredients of the medium are simple and inexpensive. (Cf. Brown, Duncan and Henry, *C. A.* 19, 840.) JULIAN H. LEWIS

The Twort-d'Herelle phenomenon. A critical review and presentation of a new conception (homogamic theory) of bacteriophage action. PHILIP HADLEY. Univ. of Michigan. *J. Infectious Diseases* 42, 265-434(1928). JULIAN H. LEWIS

Effect of reduced oxygen tensions on the growth of Clostridium botulinum (type A) in veal infusion broth. GAIL M. DACK AND MEREDITH BAUMGARTNER. Univ. of Chicago. *J. Infectious Diseases* 42, 491-4(1928).—*Cl. botulinum,* type A, was grown in veal infusion broth under reduced O pressures. No growth was obtained where the O pressure was greater than 1.3 cm. As the O pressures increased from 0.1 cm. to 1.3 cm. the time of growth became more irregular. JULIAN H. LEWIS

Gas production from commercial peptones by Bacillus aerogenes and Bacillus coli. E. LEE TREECE. Univ. of Kansas. *J. Infectious Diseases* **42,** 495-500(1928).—Gas was produced from 2 of the 4 com. peptones tested by *B. aerogenes* and *B. coli,* both in a liquid medium under vaseline and in a peptone medium solidified with agar or gelatin. The gases produced by *B. coli* and *B. aerogenes* were collected, measured and analyzed. The gas ratio (CO_2/H_2) for *B. aerogenes* averaged 8.5, varying from 5.7 to 12.8. The gas ratio for *B. coli* was infinitely higher; the value could not be detd. since the amt. of H_2 produced was too small to be measured and analyzed. This wide variation indicates fundamental differences in the modes by which *B. coli* and *B. aerogenes* break down the gas-producing substance of commercial peptone. The source of the gas seems not to be in the carbohydrate radicals of the peptone. J. H. L.

The sanitary significance of lactose-fermenting bacteria not belonging to the Bacillus coli group. 1. Groups reported in the literature and isolated from water in Chicago. FRANK E. GREER. Dept. of Health, Chicago. *J. Infectious Diseases* **42,** 501-13(1928).—2. **Number of lactose-fermenting organisms found in Chicago sewage and Chicago water supply.** *Ibid* 514-24. 3. **Bacterial associations in cultures containing lactose-fermenting bacteria.** FRANK E. GREER AND FLORENCE V. NYHAN. *Ibid* 525-36. 4. **Pathogenicity.** FRANK E. GREER, FRED O. TONNEY AND FLORENCE V. NYHAN. *Ibid* 537-44. 5. **Factors influencing the survival of microörganisms in water.** FRANK E. GREER. *Ibid* 545-50. 6. **Sanitary considerations.** *Ibid* 551-5. 7. **Media and methods.** FRANK E. GREER, R. E. NOBLE, FLORENCE V. NYHAN AND A. E. O'NEIL. *Ibid* 556-67. 8. **Conclusions.** FRANK E. GREER AND R. E. NOBLE. *Ibid* 568-74.—It is pointed out in this series of articles that other organisms besides *B. coli* occur in H_2O which ferment lactose. Some of these should be considered in judging the sanitary quality of drinking H_2O. Media that have been developed for high selectivity for *B. coli* actually, in many cases, inhibit the growth of this organism or allow the development of extraneous forms which may confuse or render cultural tests worthless as an index for the colon organism. The best combination of media and methods so far developed for routine practice include lactose broth for the presumptive test, eosin-methylene blue for the confirmatory test, and lactose broth and agar slants for the completed test.

JULIAN H. LEWIS

Bactericidal properties of the acyl and alkyl derivatives of resorcinol. BETTYLEE HAMPIL. Johns Hopkins Univ., Baltimore. *J. Infectious Diseases* **43**, 25–40(1928).—The bactericidal properties of the alkylresorcinols and their intermediate ketones were studied. The higher alkyl derivs. of resorcinol in comparison with phenol are less effective as bactericides against *B. typhosus* grown in Witte peptone broth than against the same organisms grown in Difco peptone broth. These 2 peptones differ in their nitrogenous content and in other factors not detd. In the presence of org. material at 37° the alkylresorcinols progressively lose a portion of their bactericidal activity. Beginning with *n*-butylresorcinol, the percentage of inhibitory effect increases until at *n*-heptyl- and *n*-octylresorcinol there is a total loss of disinfecting power. An elevation of temp. from 20° to 37° increases the bactericidal properties of each member of the alkyl series from the *n*-propyl to the *n*-octyl derivs. A further elevation from 37° to 45° renders nonyl- and decylresorcinol also potent as bactericides in aq. soln. Because of the increased soly. of the alkyl resorcinols in alkali, the addn. of 1% Na_2CO_3 to these compds. causes a pronounced rise in microbicidal action beyond the hexyl deriv. both in the presence and absence of org. material. The disinfecting properties of the alkyl derivs. *in vitro* depend to a great extent upon their H_2O soly. Each member of the acyl series of derivs. of resorcinol is increased in bactericidal power by an elevation of temp. from 20° to 37° from the *n*-butyryl to the *n*-hexylyl compd. These derivs. are practically ineffective as bactericides at 37° in a standard org. mixt. *n*-Hexyl-, *n*-heptyl- and *n*-octylresorcinol appear to possess a specificity in disinfection action against the vegetative forms of Gram-positive organisms at 37°. In high dilns. of the compd., the alkylresorcinols show a wide zone in which their activity against bacteria is fluctuating and uncertain. This zone is progressively increased as the alkyl chain is extended. JULIAN H. LEWIS

Influence of carbohydrates on bacterial decomposition of urea. MITSUTERU ISHIKAWA. Washington Univ. School of Med., St. Louis, and Northwestern Univ. Med. School, Chicago. *J. Infectious Diseases* **43**, 67–80(1928).—*B. ammoniogenes B. aerogenes, B. morgani, B. proteus vulgarus* and *Staphylococcus aureus* actively decompose urea in culture media; the washed cells of these bacteria also possess a definite urea-splitting activity. The presence of a utilizable carbohydrate accelerates the disintegration of urea by these bacteria, cultured and washed. Na formate added to the culture medium does not exert any increasing effect. Thymol has an inhibitory influence on the liberation of NH_3 from urea, by cultured or washed organisms, in the presence or absence of glucose. The symbiosis of urea-splitting organisms with a non-urea-splitting bacterium, in a medium containing a carbohydrate fermentable by the latter organisms but not by the former, increases the generation of NH_3, in comparison with the single culture of the urea-splitting organism. J. H. L.

Behavior of Brucella melitensis and abortus toward gentian violet. I. FOREST HUDDLESON AND ELIZABETH ABELL. Michigan State College, Lansing. *J. Infectious Diseases* **43**, 81–9(1928).—Varieties, and strains within a variety, of the genus *Brucella* exhibit a difference in sensitiveness to gentian violet in a medium, expressed in degree of growth. The growth of strains of the *Br. melitensis* and *Br. paramelitensis* variety is not inhibited on a medium by the presence of gentian violet in dilns. of 1:100,000 and 1.250,000 A few of the strains are slightly inhibited by the presence of a 1:50,000 diln. of the dye. Strains of the *Br. abortus* variety may be divided into 2 groups as regards their ability to grow on a medium in which gentian violet is present, namely, those which are markedly inhibited and those which fail to grow in the presence of 1:50,000 and 1:100,000 diln. of the dye. The latter group contains one bovine strain, several human strains and all procine strains in the possession of the writers. The difference in dye sensitivity may prove to be a means of distinguishing strains of the abortus variety not otherwise distinguishable. JULIAN H. LEWIS

The action of phenol and formol on aerobic and anaerobic organisms. JOSEPH P. SCOTT. Kansas State Agr. Expt. Sta. *J. Infectious Diseases* **43**, 90–2(1928).—Phenol in strengths up to 5% acts very slowly on anaerobic organisms, while CHOH in dilns. of 0.5 to 0.75% sterilizes anaerobic cultures rapidly. The greater susceptibility of aerobic spore-forming organisms to these disinfectants makes it possible to eliminate aerobic contaminations from anaerobic cultures by the use of 0.5% phenol or CHOH. JULIAN H. LEWIS

Surface tension in relation to bacterial growth with special reference to Lactobacillus acidophilus and Lactobacillus bulgaricus. ALEXANDER A. DAY AND WM. M. GIBBS. Northwestern Univ. Med. School, Chicago. *J. Infectious Diseases* **43**, 97–107(1928).—Coconut soap, palmitic soap, olive soap Na ricinoleate, Na oleate and Na taurocholate had no effect on the growth of *L. acidophilus* and *L. bulgaricus* which

could be attributed to the depressant action of these substances on surface tension. Na ricinoleate exerted a toxic action toward both *L. acidophilus* and *L. bulgaricus*, but this action could not be employed as a means of identifying the 2 organisms. The fermentation of maltose, sucrose and levulose does not offer a means of differentiating *L. acidophilus* and *L. bulgaricus*. JULIAN H. LEWIS

Bacterial adaptation to acriflavine. VICTOR BURKE, CATHERINE ULRICH AND DON HENDRIE. State College of Washington. *J. Infectious Diseases* **43**, 126–30(1928).—*Staphylococcus albus* shows increased tolerance for the dye after 6–8-hrs. exposure. This adaptation is temporary and disappears when the organism is grown on dye-free agar. Delayed growth in the presence of acriflavine is due in part to the process of adaptation of the organism. The increased tolerance in partially sp. *Staphylococcus* can be sepd. into 2 strains which differ in their ability to tolerate neutral acriflavine. JULIAN H. LEWIS

Choice of antiseptic dye in mixed infections. VICTOR BURKE, M. P. JESSUP AND SMITH PHILLIPS. State College of Washington. *J. Infectious Diseases* **43**, 131–6 (1928).—Gentian violet is more bactericidal than neutral acriflavine for both the Gram-positive and the Gram-negative organisms commonly found in wounds. Blood reduced the bactericidal action of both dyes. No advantage is gained by mixing the 2 dyes. The dye most effective against the most resistant organism in the wound to be treated should be used. Since bacteria acquire sp. dye tolerance in a few hrs. rotation of dyes in the treatment of infections may be beneficial. The bactericidal strength of neutral acriflavine varies with the manufacturer. Different samples from the same manufacturer are nearly uniform in bactericidal action. JULIAN H. LEWIS

The bioscopic reduction test as a means of study of bacterial life processes. The dependence of rest-reduction and catalase content of bacteria on certain factors. OTTO KIRCHNER. *Z. Immunitäts.* 52, 108–24(1927).—The quant. estn. of the catalase content of *Staphylococcus aureus*, *B. coli* and *B. pyocyaneus*, grown in sugar, sugar-free, solid and liquid media, shows that the catalase content of the culture media fluctuates very greatly. Factors that influence the catalase content markedly are the changes of reaction which lower the catalase content when to the acid side and the supply of O_2, the activity being low in anaerobic conditions and high in aerobic. After 10 days growth there is always a constant increase in catalase. In order to obtain bacteria with the lowest possible "rest-reduction," which is necessary for the bioscopic reduction test, it is necessary to employ fluid media without sugar. The relation between H_2O_2 formation and catalase content on one hand and methylene blue reduction on the other is discussed. JULIAN H. LEWIS

Pancreas and bacteriophage action. E. KLEINEBERGER. Univ. Frankfurt. *Z. Immunitäts.* **56**, 32–45(1928).—Bacteriophage is never present in normal sterile organs, but it is easily obtained from unsterile pancreas and thymus of stockyard animals. In more than 50% of hogs killed in the stockyards bacteriophage is found in the small intestines and to a less extent in other parts of the intestines. The occurrence of bacteriophage in other organs is due to a contamination from the intestinal tract. Ground sterile pancreas introduced into bouillon containing bacteriophage causes a marked increase of the latter. Sterile thymus and boiled pancreas have the same action but to a less extent. This effect of pancreas is not due to its enzymes. The bacteria from unsterile stockyard pancreas do not form bacteriophage. J. H. L.

Catalase formation by Bacillus coli and its differential value. O. FERNÁNDEZ AND T. GARMÉNDIA. *Z. Hyg. Infektionskrankh.* **108**, 329–35(1928).—The production of catalase by *B. coli* increases or decreases according to the nature of the nutrient medium. The variability is such that a classification of strains on the basis of catalase production is at present impossible. E. R. LONG

The influence of carbon monoxide and of nitric oxide on respiration and fermentation. OTTO WARBURG. *Biochem. Z.* **189**, 354–80(1927).—The effect of CO on respiration of yeast depends upon the ratio CO/O_2 in the gas mixt. Large effects were observed in liver, chorion and retina; smaller effects were noticed in embryos and sarcomas of rats while no influence was observed in the case of chicken sarcoma. It is concluded that the respiratory enzyme reacts with CO, the combination being broken up by light. The respiratory enzyme is related to but is not identical with hemoglobin, while it is not related at all to the cytochrome present very generally in cells. CO does not affect fermentation, either alc. or lactic acid fermentation. NO inhibits the fermentation metabolism of tumor tissue 50–60%. After displacing the NO by N_2 gas, the metabolism of the tumor tissue returns to normal. Alc. fermentation of yeast at 37° is completely suppressed by NO and is not reactivated after the removal of the NO. However, the higher the temp. at which the yeast is reacting with NO the less

reversible does the resulting inhibition of the alc. fermentation become. On the other hand, the NO combined with the enzyme is more easily removed the higher the temp. so that there must be 2 distinct reactions with NO, a reversible and irreversible, the latter killing the cells. It is the latter reaction which is obviously absent in tumor tissue. S. MORGULIS

Nitrogen distribution in the paunch of ruminants during feeding and starvation and its relationship to paunch infusoria. ERNEST MANGOLD AND CONSTANZE SCHMITT-KRAHMER. Tier physiol. Inst. Landw. Hochschule, Berlin. *Biochem. Z.* **191**, 411–22 (1928).—Bacterial N constitutes 10% of the total N of the paunch contents of normally fed sheep. No evidence was found that the paunch infusoria contribute an appreciable amt. to the total N content. The total N of the paunch contents in normally nourished sheep is 0.2 to 0.3%, but varies with the consistency of the contents, the nature of the food and diminishes very rapidly in fasting. On the seventh fasting day it falls as low as 0.05%. No formol titratable N could be demonstrated but NH_3 was present. S. MORGULIS

Chemical components of the spores of Aspergillus oryzae. MIDZUHO SUMI. *Biochem. Z.* **195**, 161–74(1928).—The spores of *A. oryzae* contain only traces of sol. reducing sugar or pentosan but a large amt. of mannitol; also glycogen is found in place of starch. There was much of P-contg. substances, such as lecithin, organically combined H_3PO_4 and inorg. phosphates. Of the org. bases, betaine was present in abundance, and also small amts. of stachydrin and histidine. Much chitin was isolated from the spore cell walls though it is not certain that other substances may not be present there. From the ether ext. a sterol was obtained of the compn. $C_{16}H_{28}O$, m. 160°. An ext. made with boiling water after the preliminary extn. with ether and alc. showed the presence of uric acid, as much as 0.6% of the air-dried original material. The following enzymes were demonstrated in the spores: sucrase, amylase, peptase, chymase, urease, glucosidase, peroxidase, nuclease, esterase, phytase and catalase. Lipase, tyrosinase, maltase, inulase, trehalase, desamidase and oxidase could not be definitely demonstrated. S. MORGULIS

The action of radium emanations on bacteria. H. v. SCHROETER. *Centr. Bakt. Parasitenk. I Abt. Orig.* **104**, 205–10(1927).—Ra emanation produces hypertrophy of bacterial cells, the nature of which varies in type and degree with different species. JOHN T. MYERS

Bacterium coli as an alkali-forming organism. S. GOLIKOVA. Univ. Moskau. *Centr. Bakt. Parasitenk. I Abt. Orig.* **108**, 213–9(1928); cf. *Centr. Bakt. Parasitenk. I Abt. Orig.* 96, 95(1925).—White islands sometimes appear on Endo plates which had been reddened by *B. coli* in the presence of a mixed flora as when feces have been cultured. A possible explanation is the presence of an alkali proenzyme which becomes active under the influence of alkali. This enzyme produces volatile alkali; hence the phenomenon may occur at a distance as well as by continuity. Decolorized areas do not regain color when the products of alkali formers are removed from the atm. The areas induced at a distance can induce secondary white areas. The phenomenon is not dependent on living cultures. JOHN T. MYERS

Culturing the tubercle bacillus. STEFANIA LICHTENSTEIN. Univ. Leipzig. *Centr. Bakt. Parasitenk. I Abt. Orig.* **108**, 239–41(1928).—The following method gives a very high % of positive cultures. Mix 1 or 2 cc. of sputum or other material with 10 cc. of 10% HCl, shake for 10 min. and then centrifuge for 10 min. Inoculate the sediment on the medium of Petragnani prepd. as follows. Mix 150 cc. of milk, 6 g. of potato meal and a piece of potato the size of an egg, chopped finely. Place in a boiling water bath and shake for 10 min., then let stand in the bath for 1 hr. Cool to 50° and add 4 whole eggs, 1 egg yolk, 12 cc. of glycerol and 10 cc. of 2% malachite green. Shake vigorously and filter through gauze. Tube and sterilize at 80° for 20 min. on 3 consecutive days. JOHN T. MYERS

The physical chemistry of the d'Herelle phenomenon. K. v. ANGERER. *Centr. Bakt. Parasitenk. I Abt. Orig.* **104**, 261–2(1927).—Somoluchowski developed a formula which expressed the rate of reaction between bacteriophage and bacteria and predicted a slow rate. A. attempted to confirm this experimentally by mixing bacteriophage and bacterial suspension and plating after varying periods of contact. Contrary to expectations the period of contact had no relation to the no. of lysed areas on the plates. Dead bacteria could unite with bacteriophage, thus fixing it. In 15 min., 90 to 95% of the bacteriophage was bound. After 1 hour the union was practically complete. The bacteriophage can diffuse through the agar. The reaction follows the law of adsorption, the exponent $1/N$ having a value of 0.75–0.80. One can thus calc. the amt. of free and bound bacteriophage. The bacteriophage is neither a single

organism nor a single ferment but a group of ferments. If only a few lytic doses are present, they are concd. in the most sensitive bacterial cells. The diffusion of bacteriophage can be best followed by cinematographic records. JOHN T. MYERS

The theory of growth inhibition of bacteria by hydrocyanic acid. E. LOEFFLER AND R. RIGLER. *Centr. Bakt. Parasitenk. I Abt. Orig.* **104,** 265-6(1927); cf. *C. A.* **21,** 2915.—The poisonous effect of HCN on the bacterial cell is due largely to a non-sp. interference with cystine metabolism, rather than to a change in the oxidation-reduction potential. JOHN T. MYERS

The influence of oxone (oxidases and peroxidases) of leucocytes and of bone marrow on bacteria in vivo and in vitro. A. NEUMANN. *Centr. Bakt. Parasitenk. I Abt. Orig.* **104,** 266–9(1927).—Oxone consists of the oxidases and peroxidases in exts. of bone marrow and leucocytes, which are free from hemoglobin. In the blood they are found chiefly in the cytoplasmic granules of the neutrophiles and eosinophiles. *In vitro* they favor the growth of bacteria. When injected into white mice in small optimum doses along with *B. typhi murium,* they decrease lethal power, but with larger doses virulence is increased. JOHN T. MYERS

The ectoplasm of yeast cells. The chemical constitution of the cell membranes and of substance. JOSEPH SCHUMACHER. *Centr. Bakt. Parasitenk. I Abt. Orig.* **108,** 193–207(1928).—There are 3 parts to the yeast cell: the Gram-positive lipoid contg. endoplasm, the Gram-negative cell membrane which contains a reducing substance, and the weakly Gram-positive, lipoid-contg. cement substance. The stained endoplasm can be removed by repeated washing and centrifugation with distd. water. The membrane of the vegetative yeast cell contains no lipoid or lipoid-protein complex. It consists of a S, Fe and glucosamine contg. phosphoglycoprotein. The cement substance contains a N- and P-contg. lipoid which is sol. only in hot alc. and which is apparently identical with the lipoid of the myelin sheath of nerves The cell membrane of yeast spores on the contrary contains a lipoid-protein complex. J. T. M.

Staphylococcus enzymes. HANS GROSS. Inst. exptl. Therapie, "Emil v. Behring," Marburg L. *Centr. Bakt. Parasitenk. I Abt. Orig.* **108,** 241-5(1928).- Staphylococcus filtrates contain an enzyme which coagulates citrated blood, but proteolytic enzymes were not found. JOHN T. MYERS

The action of dyes on bacteria. III. The action of mixtures of dyes. FR. SARTORIUS. Westfal Wilhelms-Univ. zu Munster. *Centr. Bakt. Parasitenk. I Abt. Orig.* **108,** 313–26(1928); cf. *C. A.* **22,** 3427.—In general, mixts. of dyes were no more active than their pure components, but the effects were sometimes additive. The most active dyes belonged to the triphenylmethane group. In general, the Gram-positive staphylococcus was more easily killed by dyes than was the Gram-negative colon bacillus. The addn. of $CuSO_4$ increased the lethal power of dyes while $CdSO_4$ decreased it. Colloidal Au, Ag and Cu solns., which in themselves are not bactericidal, markedly increase the action of dyes. JOHN T. MYERS

The value of disinfection tests. K. FISCHER. *Centr. Bakt. Parasitenk. I Abt. Orig.* **108,** 327–40(1928).—If it is desired to det. the bactericidal action of a substance, a method is necessary which gives the time required to kill all cells at a given concn. If inhibitory action is the point in question, a method must be used which employs bacterial counts. JOHN T. MYERS

The influence of putrefactive gases on Bacillus anthracis. PETRO ANDRYEVSKII. Urkanian Univ., Prague. *J. Bact.* **16,** 151–5(1928).—A bottle was half filled with cattle meat and parts of organs, with the addn. of a sufficient amt. of water and closed with a rubber stopper perforated with a bent glass tube. After putrefaction had set in the free end of the glass tube was sterilized in the flame and pushed to the bottom of a broth culture of anthrax bacilli. When the gases had bubbled through for 16 to 24 hours, all of the bacilli were dead. The principal putrefactive gases formed were: CO_2, H, CH_4, NH_3 and H_2S. These were tested separately, and H_2S was found to have the most destructive effect both on vegetative cells and spores. Cadavers of animals infected with anthrax can be treated with H_2S and the organisms so decreased in numbers that danger of spread of the disease is greatly reduced. JOHN T. MYERS

The precipitation of magnesium ammonium phosphate crystals during the growth of bacteria in media containing nitrogenous substances. SARA A. SCUDDER. Evans Memorial, Boston, Mass. *J. Bact.* **16,** 157–61(1928).—Crystals were sepd. from seven-day cultures in semi-solid agar, of *B. alkaligenes, M. catarrhalis* and *C. diphtheriae,* by melting the agar and washing with distd. water. They were preserved in 95% alc. They were mixts. of 2 and 3 compds. Compd. I had the optical properties of $NH_4MgOP_2O_6$, and compd. II those of $K_2Mg_2(SO_4)_3$. Compd. III was an unidentified

anisotropic substance which occurred as a minute fibrous aggregate too intergrown with other compds. to permit optical detn. The optical properties of single large crystals isolated from the different cultures identified them as $NH_4MgPO_4.6H_2O$. They also gave phosphate tests. Favorable factors for crystal formation are the presence of meat infusion, peptone, and inorg. phosphate, with a decrease in NaCl and moisture. A medium contg. peptone and phosphate without meat infusion is less favorable.

JOHN T. MYERS

The fermentation of glucose by organisms of the genus Serratia. CARL S. PEDERSON AND ROBERT S. BREED. *J. Bact.* **16,** 163–85(1928).—Two cultures of *Serratia marescens* formed the following products: acetic, formic, succinic, and levo-rotatory lactic acids, EtOH, acetylmethylcarbinol, 2,3-butyleneglycol, CO_2 and a small quantity of H. Two cultures of *Serratia indica* produced the same products except that no H was formed. A third strain produced the same things except that the lactic acid was inactive. A fourth strain differed in that the lactic acid was inactive and there were only traces of acetylmethylcarbinol or 2,3-butyleneglycol. There is a good bibliography.

JOHN T. MYERS

Studies on the proteolytic bacteria of milk. III. Action of proteolytic bacteria of milk on casein and gelatin. WM. C. FRAZIER AND PHILIP RUPP. Bur. of Dairy Ind. *J. Bact.* **16,** 187–96(1928); cf. *C. A.* **22,** 3428.—The action of 229 cultures of proteolytic bacteria from milk on casein and gelatin was studied. Four species of cocci and 4 of rods were found to cause no increase in amino N. The remainder fell into either low or high amino N groups. The Br test was positive in all cases of caseolysis except with *M. cereus*. *M. varians* was apparently unable to split Na caseinate but did break down Ca caseinate. Some of the other organisms seem to break down Ca caseinate easier than Na caseinate. Increasing amts. of fermentable sugar up to 0.1% did not appreciably affect the amt. of caseolysis by most organisms. With *M. percitreus*, however, caseolysis seems to decrease with increasing quantities of glucose. Caseolysis by the acid-forming *Streptococcus liquefaciens* seemed to be aided by more fermentable sugar. A study of the proteolytic milk organisms on casein and gelatin media is of value in grouping these organisms.

JOHN T. MYERS

The effect of surface tension upon the growth of the lactobacilli. W. R. ALBUS. Bur. of Animal Industry. *J. Bact.* **16,** 197–202(1928).—Fifty-eight strains of lactobacilli were studied. More than one-half the strains of *L. bulgaricus* were unable to grow in a medium in which the surface tension was depressed with Na ricinoleate to 42.6 dynes and none of the strains showed growth at 40.4 dynes after 7 days incubation at 38°. All the strains of *L. acidophilus* grew rapidly at the lowest surface tension employed, 40.4 dynes, as did a single strain of *L. bifidus*. The strains of *L. caseii* from Swiss cheese with one exception were inhibited at a higher surface tension than those from cheddar cheese or from milk. The ability of an organism, or group of organisms to grow at low surface tensions may be of value other than as a test method for differentiation. It may indicate fundamental differences in cell structure or metabolism.

JOHN T. MYERS

A comparative study of the action of sodium ricinoleate upon bacteria. ANTHONY KOZLOWSKI. N. Y. State Dept. of Health, Albany. *J. Bact.* **16,** 203–9(1928).—Streptococci from measles, erysipelas and scarlet fever were killed by Na ricinoleate at a diln. of 1:5000 in about 7 hrs. at 35°. Streptococci from other sources were less susceptible. Most streptococci were inhibited at a diln. of 1:20,000. Pneumococci under similar conditions were killed by a diln. of 1:10,000, and dissolved by 1:5000. No other organisms were dissolved by Na ricinoleate. Of the bacilli, *B. diphtheriae* was quite susceptible to the inhibitory, but much less so to the bactericidal action. *B. tuberculosis* was inhibited at a diln. of 1:2000. *B. paratyphosus*, *B. dysenteriae*, and *B. coli communis* were quite resistant to both the inhibitory and the bactericidal action. The bactericidal action of Na ricinoleate is conditioned by the sp. cellular resistance, the concn. of the soap soln., time, and temp. Na ricinoleate may be used instead of bile for dissolving pneumococci in routine diagnostic work. J. T. M.

Aromatogenic bacteria. K. P. MURATOVA. State Inst. Exptl. Med., Leningrad. *Arkh. Biol. Nauk.* **28,** 73–81(1928).—Eighteen strains of putrefactive organisms were isolated from stools of patients in the enteric epidemic of 1926. Sixteen of these strains were strongly proteolytic but inactive toward the sugars. Two strains were nonproteolytic but stongly fermentative. These have not been previously described.

W. A. PERLZWEIG

The preparation and testing of food gelatin for the bacteriological investigation of water as furnished to the outside by the Landesanstalt für Wasser-, Boden-, und Lufthygiene. HANS BEGER. *Kl. Mitt. Ver. Wasserversorg. Abwässerbeseitig.* **3,**

162-75; *Chem. Zentr.* 1927, II, 1879.—B. describes down to the minutest detail the properties of the raw materials, and the methods of prepg. and testing food gelatins.

J. S. REICHERT

Toxic power of aniline color derivatives against microörganisms. A. CH. HOLLANDE AND MLLE. G. CRÉMIEUX. *Compt. rend. soc. biol.* 99, 542-4(1928).—The quantity of Nile Blue-HCl to be added to a culture medium of peptone 10 g., NaCl 5, H_2O 1000, to prevent all development of organisms was detd. and found to vary with the organism. Nile Blue was very active against the bacilli of Loeffler and of Koch, but, in comparison, only slightly active against the pyocyanic bacillus. Gram-positive bacteria are more sensitive to Nile Blue than are Gram-negative bacteria. The pharmacotherapic action of a dye for an organism infesting animal tissues will be influenced by the constituents of the cells and humors of the host, such as sugars, albumins, etc. L. W. RIGGS

Reduction of sulfates by microörganisms in the presence of fats. G. SELIBER. *Compt. rend. soc. biol.* 99, 544-6(1928).—The reduction of sulfates by microörganisms may take place in the presence of fat or its decompn. products as a source of energy and of C nutrition. The organisms which reduce sulfates, or the organisms which accompany them, decompose the fats in anaerobiosis. At the bottom of the sea the reduction of sulfates is made parallel to the decompn. of the fats. (Cf. Bastin, *C. A.* 20, 887; 21, 879.) L. W. RIGGS

The luminous organ of Euprymna morsei Verrill and the symbiotic luminous bacteria. TEIJIRO KISHITANI. Biol. Inst. Tokugawa. *Proc. Imp. Acad. Tokyo* 4, 306-9(1928).—From the lens of the luminous organ of the cuttlefish, *Euprymna morsei* Verrill, a new species of luminous bacteria was isolated to which the name *Pseudomonas euprymna* was given. The bacteria are Gram-negative short rods; they may be stained with the ordinary aniline dyes. They emit light of bluish green color on media contg. 3% NaCl. The optimum temp. is 15-25°. The bacteria were grown on media having a p_H of 7.0. They do not liquefy gelatin, coagulate milk, or hydrolyze starch. They reduce nitrate to nitrite. Glucose, fructose, galactose, and maltose are fermented under formation of acids, but without formation of gas. Indole is not formed in bouillon. No sporulation was observed. G. SCHWOCH

Physiological studies on the nitrogen-fixing bacteria of the genus Rhizobium. RUDGER H. WALKER. Iowa Agr. Expt. Sta., *Res. Bull.* 113, 371-406(1928).—Studies were made of some physiol. activities of the N-fixing bacteria of the genus *Rhizobium* to ascertain whether or not certain tests could be used for diagnostic purposes in sepg. the various cross-inoculation groups. The studies made include agglutination, gelatin liquefaction and fermentation of sugars and other C compds. The organisms used were chiefly of the alfalfa and sweet-clover, soy bean, pea, red clover and dalea groups. *Bacillus radiobacter* was also studied for purposes of comparison. Agglutination occurred in all homologous tests. In the heterologous tests agglutination occurred only when the organisms in question had been isolated from plants belonging to the same cross-inoculation groups. The results secured furnish strong evidence of a direct correlation between the groups of legume bacteria when they are classed according to their ability to cross-inoculate, and when they are grouped according to their serological reactions in cross-agglutination. The results of the fermentation studies in synthetic N-free media indicate that the legume bacteria attack monosaccharide sugars with a greater production of acid than they do the disaccharides or trisaccharides, the polyatomic alc. dulcitol, the benzene deriv. inositol or the polysaccharide dextrin. There is a wide variation among organisms of the same cross-inoculation group when they are compared upon the basis of their ability to change the reaction of sugar media. The variations among strains within a single cross-inoculation group in this respect are as great or greater than the differences between organisms of different groups. The growth of most of the organisms tested in media contg. N as peptone caused the reaction to become more alk. The variations in the quantity of acid or alkali produced in peptone media were wide, and as great between strains of a single group as between strains of different groups.

J. J. SKINNER

Respiratory pigment, cytochrome in bacteria. HIDETAKE YAOI AND HIROSHI TAMIYA. Tokyo Imp. Univ. *Proc. Imp. Acad. (Japan)* 4, 436-9(1928).—A close parallelism between the cytochrome content and the intensity of aerobic respiration holds in all bacteria examd. (relative concn. detd. spectroscopically). In almost all of the aerobic bacteria examd., cytochrome was always found with its 4 characteristic bands; *B. pyocyaneus*, *B. subtilis* and *B. cholerae* show most clearly the spectrum of cytochrome, very similar to that of baker's yeast. In the majority of the other bacteria examd., the band *b* is stronger (the band *c* is weaker or possibly absent) and the band *d* lies in the position of longer wave length (532 $\mu\mu$). In all strains of *B. dysenteriae*,

excluding the Shiga bacilli and *B. coli*, a characteristic extra band at 623–37$\mu\mu$ is found besides the known bands of cytochrome. C. J. West

The influence of anions and cations on the viability of Bacillus coli. C. H. Boissevain and Eric Webb. *J. Lab. Clin. Med.* **13**, 1027–35(1928).—The optimum concn. for the viability of the colon bacillus is $M/4$ in the case of nonelectrolytes and $M/8$ in the case of binary electrolytes. The H-ion concn. in PO_4 solns. is of small importance as long as it remains above p_H 5 and below p_H 8. Cations are without effect on the viability of the colon bacillus, except for a valency effect. The series of increasing toxicity for the anions is HPO_4^{--}, NO_3^-, Cl^-, SO_4^{--}, I^-. Their effect is purely additive; no evidence was found of "balancing" the toxicity of one ion by that of another. The HPO_4 ion is the only mineral constituent necessary for the life of the colon bacillus. Part of the toxicity of distd. H_2O and salt solns. may be due to the fact that they permit the diffusion of the HPO_4 ion out of the bacteria. The no. of colon bacilli remains const. in a soln. contg. a mixt. of NaH_2PO_4 and Na_2HPO_4 of p_H 7. The no. of bacilli increases if traces of org. material are present in the soln.; *e. g.*, cotton fibers or dead bacilli. Ethel W. Wickwire

The relative toxicity of gentian violet for certain members of the colon group of organisms. W. D. Stovall, M. Starr Nichols and Vera Vincent. *J. Lab. Clin. Med.* **13**, 1036–40(1928).—Gentian violet has a marked inhibitory effect on the growth of *B. coli* in a diln. of 1–20,000. In this strength it prevented growth in 90% of the methyl red and 50% of Voges-Proskauer cultures used in these tests. The inhibitory effect was evident on the methyl red-positive cultures in a diln. as high as 1–75,000, while it appeared not to affect the Voges-Proskauer-positive group until a very much lower diln. (1–30,000) was reached. The inhibitory action is noticed in the higher dilns. by the lag produced in the growth of the cultures. This lag effect is seen in the methyl-red-positive in much higher dilns. than in the Voges-Proskauer-positive cultures. There is a marked difference in the resistance of the 2 groups of organisms to the dye. Within the same groups there is variation in sensitiveness of the organisms to the action of the dye. E. W. W.

Microbiology of coals in the seam (Lieske, Hofmann) 21. Results of a systematic study of water from the Vistula (Kirkor) 14.

D—BOTANY

THOMAS G. PHILLIPS

Interrelationships of certain physicochemical constants of plant saps. Ross A. Gortner and Rachel Rude. Minn. Agr. Expt. Sta. *Proc. Soc. Exptl. Biol. Med.* **25**, 630–5(1928).—Calcns. were made to see if there was any direct relationship between the bound-water content of the plant saps studied by Meyer and any of their physicochem. properties. There were no high coeffs. of correlation found. This demonstrates that the measurement of bound water in a plant sap is the measurement of a factor essentially independent of the properties previously measured, and that the bound-water values cannot be obtained from any of the ordinary measurements. Detns. of the bound water may prove helpful in studying the properties of plant saps as related to geographical distribution. There is a marked difference in the physicochem. properties of the plant saps of the ligneous and herbaceous plant forms. C. V. B.

The absorption and utilization of plant nutrients. Walter-Ulrich Behrens. Univ. Königsberg i. Pr. *Z. Pflanzenernähr. Düngung Bodenk.* **11A**, 93–108(1928).—Vegetation expts. with oats plants in sand cultures and a const. renewal of the soln. by having the soln. run through the cultures are described. The app. consisted of a culture vessel with a reservoir (large bottle) so placed as to allow the nutrient soln. to be siphoned by drop into the culture. The culture vessel was provided with a proper outlet for the soln. The plants were analyzed for the different plant nutrients (N, K_2O, P_2O_5). The results show that the plant nutrients are absorbed from a N concn. of only 2.2 mg. per l. and from a P_2O_5 concn. of 0.65 mg. per l. as well as from more concd. solns. With the highest concns., the utilization decreases with increasing yield before the max. yield is reached. Nutrients can only be absorbed from dil. solns. with an expenditure of free energy which is supplied by certain chem. processes connected with the nutrient absorption. The affinity of these reactions is large in proportion to the free energy, which represents the difference in concn. between the active medium and cell sap. Inside the plant, the utilization of nutrients is not lower from very dil. soln. than from concd. solns. There is apparently a contradiction here in that generally the P_2O_5 from difficultly sol. phosphates is utilized very poorly in the plant. This

discrepancy is explained in that the nutrients from difficultly sol. combinations are available at a later stage of development of the plant than are the more sol. combinations. An expt. shows that the nutrient content of the plant depends very largely upon the time when the nutrients are absorbed. R. M. BARNETTE

The mathematical formulation of the action of plant nutrients. W. U. BEHRENS. Univ. Königsberg i. Pr. *Z. Pflanzenernähr. Düngung Bodenk.* **11A**, 150–5(1928).—In vegetation expts. with increasing applications of a plant nutrient, the following serve as a measure for the action of the plant nutrient: (1) the utilization of the plant nutrient, (2) the inner production's value (the proportion of the dry substance obtained to the amt. of plant nutrient taken up by the plant), and (3) the outer production value (the proportion of the dry substance obtained to the amt. of plant nutrient applied). All these values must be considered as functions of the "specific yields" (yield expressed as fraction of the max. yield). The course of these functions depends upon whether the nutrient is given in an easily sol. or difficultly sol. form. R. M. BARNETTE

The influence of salt solutions on the starch content of Drosera. ALFRED GIESSLER. *Flora* **123**, 133–90(1928).—Mature leaves of *Drosera capensis* ordinarily contain much starch in summer but during the winter they are quite starch-free. If cut leaves of this plant contg. starch are kept in an atm. satd. with water vapor, they do not lose their starch either in light or darkness. Thus treated, starch has been found present even after 45 days. Wilting favors the disappearance of starch. In this case after 1 or 2 days hardly any starch remains. If a paste prepd. from flies and saliva is placed on a starch-contg. leaf of *Drosera* and after 3 days this leaf is tested for starch, it is found that most of the starch has disappeared from beneath the spot on which the paste rested. It was also found that many salt solns. behaved similarly when drops of them were placed on *Drosera* leaves. Plants in pots under bell jars and also cut leaves in Petri dishes and leaves floated on salt solns. were used. Starch was tested for by the ordinary Sachs I method and the relative quantity of starch was judged by the depth of color produced. Fourteen common salts were used in 0.2, 0.1, 0.04 and 0.02 *N* solns. The effect of temp. was particularly studied. At 0–10° drops of salt solns. caused no starch disappearance; at 12–16° it was just noticeable; at 16–18° marked, at 18–36° very rapid, at 36–38° there was beginning of temp. injury to the leaf, at 38–50° the leaves were badly injured. The effect of common anions on starch disappearance is: $NO_3 > PO_4 > Cl > SO_4$. For anions, the ordinary lyotropic series is followed except it is in reverse sequence to the arrangement for most reactions of animal chemistry. Colorimetric detn. of p_H values showed that the effect of the salt solns. on starch digestion was noticeable both in weakly acid and weakly alk. media. It was further detd. with cut leaves fed with sugar solns. that starch formation in the leaf was hindered by salt solns. With leaf pastes, salt solns. were shown to bring about a slight starch break-down. In general, salt solns. increase the CO_2 output of cut leaves of *Drosera*. Expts. conducted with the exclusion of light and at const. temp. showed that certain salt solns. could cause a doubling of respiration intensity. In most cases, however, immediately after contact with the salt soln., respiration intensity was decreased for a time previous to the rise. Increased starch digestion in the presence of salt solns. may be explained on the basis of enzymic activation. Beech leaves were also tested with salt solns. and starch metabolism was found to be similarly affected. This behavior, therefore, is not limited to the leaves of carnivorous plants. R. C. BURRELL

Amphiteras antediluviana Ehrbg., and some contributions to the structure and development of diatom cells. WERNER LIEBISCH. *Z. Botan.* **20**, 225–71(1928).—Many investigators have assumed that the hard coating of diatom cells is composed of silicic acid impregnated with org. material. Tests with HF solns. which dissolve siliceous but not org. material showed no org. residue from the hard coating of this diatom. There is, however, an underlying membrane which appears to be composed of pectic material. Also the jelly-like cushions between the diatom cells give similar color reactions to those of pectic material. Much additional material of a purely botanical nature is included as method of culture, morphology of the cell, cell division, spore formation, etc. R. C. BURRELL

The influence of light and of glucose on the growth of a soil alga. B. MURIEL BRISTOL ROACH. *Ann. Botany* **42**, 317–45(1928).—Continuing studies on the C nutrition of algae isolated from soil (cf. *C. A.* **20**, 2180; *Ann. Botany* **41**, 509–517), R. attempts to answer the question whether soil algae contribute to the fertility of the soil by adding org. matter or detract therefrom by immobilizing nitrogenous matter otherwise available for crops. *Scenedesmus costulatus*, var. *chlorelloides* was grown under

controlled aeration in parallel cultures with mineral salts plus glucose in the dark and light, and with mineral salts alone in light, thus permitting measurement of the effect of photosynthesis upon the rate of increase in bulk. The intensity of the light supplied was varied over a wide range, with the result that growth increased directly with increased intensity up to a definite limit beyond which no significant increase in growth rate occurred with increasing light. At high light intensities, nutrition is purely photosynthetic, no increase in rate of growth occurring when glucose is added to the medium. At low light intensities, the total growth with glucose present approximates the sum of growth in light on mineral salts plus that in dark on glucose. In the lower layers of the soil, the organism grows at the expense of the directly available org. compds. present; at the surface it will be self-maintaining by photosynthesis or will draw in varying degree upon the available org. matter of the soil according as the light may vary in intensity. In *Chlorella* and *Cystococcus* spp. the semi-saprophytic habit is much more firmly established. JOSEPH S. CALDWELL

Relations among the individual properties of barley (corn), and the influence of the weather on the nitrogen content. G. STIEHR. *Allgem. Brauer- u. Hopfen.-Ztg.* **67,** 1032–3; *Chem. Zentr.* **1927,** II, 1766.—Extensive data already available are surveyed and compiled in diagrams to render them more easily accessible, especially for the comparative value in the future. Reference is made especially to the surprising differences in the N content of 2 seasons of barley. Conclusion: Weather plays a part in the vegetation period of barley. C. C. DAVIS

The action of silicic acid in increasing the yield of crops. WALTER OBST. *Kunstdünger Leim-Ind.* **24,** 345–6; *Chem. Zentr.* **1927,** II, 2001.—A summary of earlier expts. on the part played by SiO_2 in the nutrition phenomena of plants. C. C. DAVIS

Microchemical investigation of the structure of the collenchymatous cell wall. DONALD B. ANDERSON. *Sitzb. Akad. Wiss. Wien, Abt. I,* **136,** 429–39(1927).—Chem. and phys. tests indicate that the cell wall of the collenchyma of *Solanum lycopersicum* possesses an homogeneous structure. Its angular thickening consists of a leafy structure composed of lamellas which are built up alternately of pectin and cellulose material. Normal untouched collenchyma shows double refraction between crossed nichols. After treatment with copper ammonium hydroxide which removes the cellulose the cell wall becomes isotropic. Only pectin material remains in the cell wall after removal of the cellulose. Treatment of the collenchyma with H_2SO_4 and KI clearly shows a stratification of the lamellas. The layer structure of cellulose and pectin accounts for the following facts: (1) the high water content of the cell wall, (2) the powerful contraction of the thickened angles in the radial direction when placed in dehydrating agents and noteworthy expansion when placed in water, (3) the loss of high water content and shrinkage on heating, (4) the diverse views of various investigators regarding double refraction of the collenchyma and, finally, the great elasticity of the cell wall. L. T. FAIRHALL

Preliminary report on amino acid synthesis in plants. WALTER F. LOEHWING. State U. of Ia. *Proc. Iowa Acad. Sci.* **34,** 115–8(1927).—It appears that fruit formation robs vegetative structures of normal tomato plant of nitrates, ammonia and amino acids. When defruited plants are supplied with nitrate fertilizer, the nitrates are absorbed as such, accumulate at and are actively reduced in the vicinity of meristem, to nitrites, ammonia and amino acids. This reduction is most marked in alk. tissues about the pericycle. In fact, if the behavior of the expressed sap be employed as a criterion, it appears that this alky. and the presence of sugars are indispensable for nitrate reduction and amino acid formation. The steps in the process, then, are: nitrates to nitrites to ammonia to amino acids in presence of sugars. Reduction is not enzymic as boiled expressed sap reduces as efficiently as unboiled. Investigation is under way to det. the nature of the reducing agent, which is apparently bound up with the occurrence of carbohydrates. A short bibliography is appended. W. G. GAESSLER

Studies on pectin. III. The degree of esterification of pectin in the juice of the lemon. ARTHUR G. NORMAN. Univ. Birmingham. *Biochem. J.* **22,** 749–52(1928); cf. *C. A.* **22,** 2766.—The figures for methoxyl in the purified pectin approach the theoretical value for tetramethylpectic acid. BENJAMIN HARROW

Effect of temperature on the permeability of protoplasmic membrane. B. SEN. Vivekananda Lab., Calcutta. *Proc. Roy. Soc.* (London) **B103,** 272–88(1928).—The permeability of the plasma membrane in plant cells to ions first increases with rising temp. In some species, the permeability scarcely changes between 30° and 40°. The permeability then decreases between 35° and 40° and the lethal temp. At the lethal temp., the plasma membrane becomes highly permeable, an irreversible change. JOSEPH S. HEPBURN

Investigations of the cell-wall substances of plants with special reference to the chemical changes taking place during lignification. E. J. CANDLIN AND S. B. SCHRYVER. Imperial Coll. Sci. and Technology. *Proc. Roy. Soc.* (London) **B103**, 365–76(1928).—The cell walls of plants contain cellulose, lignins, hemicelluloses and pectins. The hemicelluloses and pectins are formed by conjugation of sugars and sugar acids (*uronic acids, i. e.,* glucuronic and galacturonic acids); hence they form a distinct chem group, the *polyuronides*. The pectins are richer in uronic acids than the hemicelluloses, while these acids do not occur in the lignins. When treated with dil. alk. solns., pectins undergo decarboxylation even at room temp.; among the products are hemicelluloses. No direct connection has been traced between pectins and lignins. Non-lignified plant tissues contain relatively large amts. of pectins, small quantities of hemicelluloses and no lignin. Lignified tissues contain relatively large amts. of lignin and hemicelluloses, and only traces (if any) of pectin. Apparently, decarboxylation occurs during lignification. JOSEPH S. HEPBURN

A method for the study of chromosomes in pollen-mother-cells. JOHN BELLING. *Univ. California Pub. Botany* **14**, 293–9(1928).—A histochem. method for the study of the chromosomes during mitosis is described. For fixing and staining, use is made of (1) a soln. contg. CrO_3, glacial AcOH, and HCHO in the proportion 1:10:16 or 1:10:8; (2) a soln. of $Fe^{+++}NH_4$ alum, and (3) an alc. soln. of brazilin. For the details, reference must be made to the original paper. JOSEPH S. HEPBURN

The metabolism of variegated leaves. WALTER SCHUMACHER. Bot. Inst. der Univ. Leipzig. *Planta Abt. E., wiss. Biol.* **5**(2), 161–228(1928).—A chem. analysis of white and green tissues of variegated leaves gave the following differences for the white as compared with the green portions: less total N, less protein N, greater sol. N, less carbohydrates, greater peroxidase and less catalase content. When leaves of *Acer negundo* and *Cornus alba* were placed in a sugar soln., the white tissue showed an increase in protein N ranging from 2 to 20 times the slight increase for the green areas. Other N fractions showed a decrease or no change in value A lower rate of respiration occurred in the white than occurred in the green tissue, but the respiration quotient (CO_2/O_2) was the same for both, *i. e.*, equal to approx. unity. A considerable portion of the paper is devoted to the nature of the physiol. processes involved during greening. In the dark greening occurred more rapidly at a high temp. (20–35°) than at a low temp. (3–5°). The importance of temp. as a factor in the greening process is emphasized by S. Future work on variegation, it is believed, should pay special attention to temp. effects. A. E. HITCHCOCK

Origin of starch in the potato. H. COLIN AND R. FRANQUET. *Bull. soc. botan. France* **74**, 451–8(1927); cf. *C. A.* **22**, 4151.—Reducing sugars, sucrose, and starch were detd. for the leaf, petiole, stem, and tuber of the potato. In all parts of the plant sucrose was found constantly associated with starch. The ratio of reducing sugars to sucrose varied considerably not only in different parts of the plant, but also in the same parts at different stages of growth without a corresponding change in starch content. Intermediate products between starch and sucrose were not detected. The authors see no reason for assuming a direct origin of starch from sucrose. Theories relating to the origin of starch are discussed in connection with the data presented. A. E. HITCHCOCK

Occurrence and distribution of pectic warts. JOS. KISSER. *Jahrb. wiss. Botan.* **68**, 206–30(1928).—The presence or absence of pectic wart-like swellings on the cell walls of plants is suggested as a possible systematic character to be used in classification. These swellings usually occur on the side of the wall which is exposed to intercellular spaces. In addn. to an extensive review of the literature (48 references being cited) K. has added 161 species to the list of plants which have been examd. for these swellings. Of this no. 46 species contained the pectic warts. Certain spherical swellings known as slime balls are considered to be closely related to the pectic warts. Both types give the pectic reaction and both have a similar location on the cell walls. Before being subjected to the test reactions, the sections were first treated for 30 min. in Javelle water in order that the swellings would remain permanently fixed. The following 3 reactions were used for the identification of the pectic substances in the swellings: (1) soly. in dil. soln. of HCl with subsequent addn. of dil. NH_4OH (unless heated the warts would merely swell up); (2) soly. in 3% H_2O_2 at 50°; (3) color reaction with Ruthenium-red (red). It is not known what physiol. role these swellings may have. A. E. HITCHCOCK

Influence of geotropic stimulation on the sugar and acid content of shoots. THEO. WARNER. Pflanzenphysiol. Inst. der Univ. Berlin. *Jahrb. wiss. Botan.* **68**, 431–96 (1928).—In geotropically stimulated shoots of *Helianthus annus, Silphium perfoliatum,*

Dahlia variabilis, and the potato the lower side was found to contain more reducing sugars than the upper side. Increasing the period of stimulation produced greater differences (ranging from 1 to 50%) in the amt. of reducing sugars, at least for periods up to 18 hrs. and in some cases up to 144 hrs. Passive bending not due to geotropic stimulus failed to produce similar changes in reducing sugar content. Methods used by previous investigators in connection with similar expts. are criticized on the grounds that the methods were not sufficiently accurate to det. small amts. of reducing substances. The author followed the methods of Rupp and Lehmann (1909) and Hertzfeld (1912) for detg. reducing substances. The first named method depends upon the reaction in which free I is produced in the presence of KI by the action of the unreduced Cu in Fehling soln., and the subsequent titration of I with $Na_2S_2O_3$. Using 1 to 2 g. samples a difference of 1% in reducing sugars could be detected by this method. The second method is based on the fact that in an alk. soln. aldose and ketose sugars reduce methylene blue. Max. differences in reducing sugar content were obtained when the shoot was placed at from 90° to 135° from the vertical, a sharp decline resulting for angles greater than 135°. The free acid content was greater in the upper side than in the lower side. No correlation existed between the acid content and the duration of the period of stimulation. No difference in water content was obtained for the 2 sides of the shoot. The osmotic value of the cell sap was the same on both sides in spite of the fact that the lower side of the shoot contained a higher concn. of reducing sugars. The significance of the difference in reducing sugar content as a result of the geotropical reaction is therefore still not understood. A. E. HITCHCOCK

Nitrogen bases in the protein catabolism of higher plants. GUSTAV KLEIN AND MAX STEINER. Pflanzenphysiol. Inst. der Univ. der Wien. *Jahrb. wiss. Botan.* **68,** 602–703(1928).—NH_3 and volatile amine detns. were run on the floral parts, and in some cases on the leaves, of approx. 100 species of higher plants. NH_3 was found in the distillates of all plants examined, and the amines in the distillates of 42 out of 103 species. The following amines were found in amts. ranging from 0.0005 to 0.2 mg. per 100 g. fresh wt.: methyl, dimethyl, trimethyl, *i*-amyl, and *i*-butyl. The special methods necessary for micro-analytical detns. are fully explained in the review of literature which includes 165 references to all phases of the work discussed by the authors. Identification of the amines is based on crystal form, color reaction and m. p. An approx. quant. value is arrived at by comparison with a key worked out for known amts. of pure amines. It is pointed out that these volatile amine bases are of considerable biological importance both as the principal constituent of insect attrahents in flowers and as a possible use in the systematic classification of plant species. A. E. HITCHCOCK

Content of calcium and magnesium of some plants in the Mediterranean region. E. CANALS AND G. DAUCAN. *Bull. soc. chim.* **43,** 779–84(1928).—Most of the phanerogams examd. contain more Mg in the leaves than in the roots. Xerophytic plants are lower in Mg than the hygrophytes. The grasses from the salty lands are relatively low in Mg. Ca increases with the age of the leaves. The variations in Mg content are less, except in *Sedum altissimum,* where the proportion of Mg found in the plants collected in Oct. is about one-third of that in March. H. R. KRAYBILL

Carbohydrate changes during the ripening of plantains. S. RANGANATHAN, JR. *J. Indian Inst. Sci.* **11A,** Pt. 7, 80–3(1928).—Exts. prepd. from ripening plantains and the tannin-free pulp failed to show diastatic activity. The results confirm those of Falk and McGuire (*C. A.* **15,** 2454) in contrast to those of Tellarico (*C. A.* **2,** 2105) and Bailey (*C. A.* **7,** 1066). H. R. KRAYBILL

The carbon/nitrogen ratio in the wheat plant. PHYLLIS A. HICKS. *New Phytologist* **27,** 1–46(1928).—A study of the C/N relations was made throughout the life history of 3 strains of wheat of different lengths of growth periods. Total C and N were estd. by microanalytical methods. All strains under similar conditions produced embryos with similar C/N ratios regardless of the actual amts. of C and N. Early stages of germination show a low C/N ratio. A low C/N ratio is associated with vegetative activity. The C/N ratio rises steadily throughout the period of vegetation and when a sufficiently high ratio is reached flowering occurs. Each strain has its own distinctive C/N ratio at which flowers are initiated. Conditions for the initiation of flower primordia (high C/N, low N) are the reverse of those required for fruit development (low C/N, high N). The younger the tissues, the lower the C/N ratios are. H. concludes that the results strongly support the statement of Kraus and Kraybill that "Fruitfulness is associated neither with the highest nitrates, nor the highest carbohydrates, but with a condition of balance between them." H. R. KRAYBILL

Distribution of carbon/nitrogen ratio in the various organs of wheat plant at

different periods of its life history. PHYLLIS A. HICKS. *New Phytologist* **27,** 108–23 (1928).—The C/N relations were studied in detail in different parts of the Starling strain of wheat at 3 stages; the seedling, the vegetative and the fruiting stage. The C/N ratio decreases in value from bottom to top of the stem. C remains rather const. throughout the stem and the N decreases from top to bottom. The results confirm a previous statement by the author that "the younger the tissue, the lower the C/N ratio." H. R. KRAYBILL

Maintenance of semi-permeability in the plant cell during leaching experiments. F. C. STEWARD. *Proc. Leeds Phil. Lit. Soc.*, Sci. Sect., I, Pt. 6, 258–70(1928).—An app. for leaching beet root slices under sterile conditions is described. Evidence is given showing that leaching phenomena applied to living tissues do not afford a means of detg. the chem. nature of substances present in the cell walls or limiting protoplasmic surface of plant cells. Prolonged leaching expts. indicate that such treatments do not necessarily result in loss of semi-permeability. Bibliography of 41 citations is given. H. R. KRAYBILL

The effect of mosaic on the globulin of potato. MAYME DVORAK. *J. Infectious Diseases* **41,** 215–21(1927).—With the precipitin test it was found that the globulins of the cell sap and cytoplasm from healthy potato plants reacted differently from those from potato plants infected with mosaic, indicating that the changes in the globulins were due to the action of the disease. JULIAN H. LEWIS

Studies in the physiology of fruit trees. II. The effects of ringing, double ringing and dis-budding upon the starch content and cambial activity of two-year-old apple shoots. THOMAS SWARBRICK. Univ. of Bristol Agr. Research Sta. *J. Pomology Hort. Sci.* **6,** 296–312(1928); cf. *C. A.* **21,** 3650.—In appls-tree shoots starch disappeared above, but not below, the rings in early May. Xylem formation began earlier above the rings than below them. About June 8 starch began to accumulate above the ring and disappear below. Lateral outgrowths and xylem formation also appeared below the rings at the same time. Later, starch was extremely abundant above the rings which did not heal Where rings healed the amts. of starch above and below were equal. The starch cycle and cambial activity were normal in sequence but delayed between 2 rings. No starch disappeared between disbudded rings until the middle of July but it was accumulating above the upper ring. No xylem formed between disbudded rings Healing of the rings caused starch to disappear and xylem to form. Shoots disbudded, except for terminal bud, had almost normal starch cycles and cambial activities. Starch did not disappear from completely disbudded shoots until very late in the season. Subsequent bud development invariably caused starch to disappear and xylem to form below the origin, but not above such buds. Starch disappearance was complete, irrespective of vigor. A temporary disappearance of starch especially from the phloem during winter was established. It reappeared prior to the beginning of spring growth. Developing buds appear to play an important role in the initiation of cambial activity and starch disappearance in woody stems in spring. Starch disappearance in spring begins in the xylem before cambial activity is very far advanced and cambial activity ceases in the fall when starch accumulates. Slowing down of elongation growth was accompanied by a marked starch accumulation in the stems. 25 references are given. A. L. MEHRING

The action of a deficiency of water on the protein exchange in higher plants. KURT MOTHES. Botan. Inst. Univ. Halle. *Ber. deut. botan. Ges.* **46,** General Meeting Number, 59–67(1928).—In plants low in water the older leaves wilt first. In these leaves there is protein decompn., even in the presence of sufficient carbohydrates, and the products are in part oxidized, and in part translocated to younger leaves. Expt. shows that wilted leaves show greater protease activity than similar turgid leaves. In wilting there is at first an increase in respiration and then a decrease below normal. LAWRENCE P. MILLER

Crown plasmolysis. KARL HÖFLER. *Ber. deut. botan. Ges.* **46,** General Meeting Number, 78–82(1928).—Working with the epidermis of the bulb of *Allium cepa*, H. observed what he called crown plasmolysis, characterized by the protoplast appearing in 3 sep. portions, a deep red vacuole space and 2 transparent, hyaline, colorless, crown-shaped constituents on both sides. This type of plasmolysis is produced by K, Na, and Li salts, not by Ca, Ba, Sr, Mg and NH_4 salts nor by any org. substances investigated. The action of Ca is antagonistic to that of K so that if to a soln. of KNO_3 or KCl, $^1/_{25}$ to $^1/_{50}$ of its vol. of Ca salt is added no crown plasmolysis occurs. Sr and Ba act similarly but $MgCl_2$ even if present in the ratio of 2 pts. KCl to 1 pt. $MgCl_2$ does not prevent plasmolysis. LAWRENCE P. MILLER

Narcosis of carbon dioxide assimilation and the method of counting bubbles.

TH. SCHMUCKER. *Biochem. Z.* **195**, 149–60(1928).—CO_2 assimilation is a process very sensitive toward narcosis. Stimulation occurs only seldom and is not very marked. Usually the effect is an injury of prolonged after-effect. The findings of a strongly stimulating action of CH_3CHO could not be verified. The narcotic effect, *i. e.*, the reversibly inhibiting concns., are: for $CHCl_3$ 0.025–0.100%; for EtOH 1–3 vol. %; for Et_2O 0.2–2.5%. S. MORGULIS

Biochemistry and physiology of phosphorus compounds in plants. I. Exosmosis of phosphorus compounds. V. ZALESKII AND V. MORDKIN. Plant Physiol. Lab., Charkow. *Biochem. Z.* **195**, 415–20(1928).—The exosmosis of organically bound P and of phosphates was studied on living plants. Permeability varies considerably. Resting seeds allow much more organic P to pass out than either germinating or unripe seeds. Ripening is accompanied by an increase and germination by a decrease of permeability. The extent of exosmosis of P compds. depends upon their amt. and mode of combination in the plant cell. It is not regarded as probable that the phosphatides which diffuse into the water belong entirely to the membranes. S. MORGULIS

The distribution and properties of resinous substances in various parts of the trunk of pine trees (Pinus silvestris) according to seasons. I. V. FILIPOVICH AND V. A. VUISOTZKII. *J. Chem. Ind.* (*Moscow*) **4**, 953–60(1927).—A systematic chem. study was undertaken to abolish the crude empiricism reigning in the industry of tapping resinous substances and to elucidate the mechanism of formation of the latter, as well as their role in the life of the tree. The heartwoods and the sapwoods were sepd., cut into small pieces in the direction of the grain and their respective resinous materials were extd. separately with Et_2O in a Soxhlet app. The resinous material extd. from the heartwood is clear yellow; that from the sapwood is greenish. The former is much less stable than the latter, being more apt to form cryst. ppts. on standing in air; these ppts. are evidently products of chem. alteration, since their acid and sapon. nos. are always higher than those of the original substances, whereas the acid and sapon. nos. of the mother liquors remain practically unchanged. These ppts. cannot be redissolved in their mother liquors by mere warming. The acid nos. of the heartwood resinous material are, for samples cut in wintertime, generally higher than those of the sapwood material, but in midsummer the difference is not so great. The difference between the sapon. coeff. and the acid number is generally insignificant (0–8) for heartwood resinous material; for sapwood resinous material it is always much larger (6–28). As a rule the content of components which can be sapond. and salted out (cf. *C. A.* **22**, 3541) is less for sapwood resinous matter than for heartwood resinous matter, whereas its unsaponifiable content is higher. The non-volatile residues of steam distn. (rosins) from heartwood are viscous liquids which do not solidify at —14°; from sapwood the resinous material from lower parts of the tree is a solid whose m. p. depends on the season of the cutting and on the height at which it has been made. The acid no. of the heartwood rosin varies with the season only from 132 to 163; that of the sapwood rosin fluctuates between 52 and 151. The quantity of substances which can be saponified and salted out is for the heartwood rosin always higher than its unsaponifiable matter; it may be lower for sapwood rosin. The rosins vary in compn. according to the height on the tree at which the cutting is made. The content in components which can be saponified and salted out apparently decreases, for the winter rosins, with the height of the cutting, but the acid nos. (172–176) and the sapon. coeffs. (175–178) of the same samples remain almost const., whereas in the original resinous materials from which these rosins were derived the fluctuations according to height are considerable, though irregular. The amount of unsaponifiable (which apparently consists of heavy terpenes) increases with the height of the cutting from 7.34% at the level of the ground to 9.70% at the height of 8.34 m. and its chem. consts. vary. The resinous substances of the trees migrate from place to place and also vary in compn. in the course of the year. In the countries where the winter is cold and the sapwood freezes, the main mass of resinous substances concentrates in the uncongealed heartwood. The m. ps. of the rosins derived from the heartwood are lower in summer; the sp. grs., both for heartwood and sapwood, rise in midsummer and drop in autumn; the angle of rotation is negative in winter and positive in summer; finally the acid and sapon. nos., as well as the % of substances which can be salted out, are also strongly affected by the seasons. BERNARD NELSON

Study of the amylase of some green plants. ADRIEN GOFFAUX. Inst. Carnoy. *Bull. trimestr. assocn. élèves école sup. brasserie univ. Louvain* **28**, 74–80(1928).—The expts. described show that the leaves of Leguminosae contain more amylase than those of the potato plant, annual *Mercurialis* and Gramineae (rye and millet); that the stems also contain amylase but in smaller quantity than the leaves; and that under

given exptl. conditions the rate of hydrolysis by a given ext. of fresh or dried leaves of pastes prepd. from different starches varies but the final product is always maltose.
A. Papineau-Couture

The decrease in alkaloid content in plant parts in the drying process. H. Metsapa. *Pharmacia* **1926**, No. 5, 7 pp.; *Chem. Zentr.* **1927**, II, 1489.—Various parts of the plants cultivated in Dorpat, *Atropa belladonna, Hyoscyamus niger, Datura stramonium, Conium macalatum, Nicotiana tabacum* and *Nicotiana rustica,* were studied for alkaloid content in various periods of vegetation. The data are compiled in tables and show that all plant parts under investigation lost a part of their active principle on drying. The loss varies with the vegetation period and with the year. It is generally greater with the larger water content. The highest loss occurs with the roots, then with the stems and leaves. The lowest loss is with the seeds. The highest loss is with *Hyoscyamus,* then *Datura, Belladonna, Nicotiana* and least with *Conium.* The loss in total alkaloid content varies between 2 33 and 92.49% except in the case of the *Stramonium* stems. The highest alkaloid content is present, in general, in the roots before and after the vegetation period, the stems at the start of the blossoming period, the leaves of *Belladonna* in the first half of the blossoming period, the *Hyoscyamus* and *Datura* in full bloom and the *Conium* toward the end of the blooming period. The least alkaloid was present in the plants of 1923. The plants under investigation compared favorably in alkaloid content with plants of other countries. J. S. Reichert

Some experiments and considerations in the realm of the biomechanics of plants. Bohuslav Stempel. *Sbornik Ceskoslov. Akad. Zemedelske* **2**, 1–25; *Chem. Zentr.* **1927**, II, 945.—S. detd. the vegetation factor (the time) in the course of which the function factor (the amt. of nourishment given to the plant) was varied. The effects of the NO_3 *ion* and the PO_4 *ion* are opposite in so far as the first promotes the formation of chlorophyll while the second favors early maturity by lessening the possibility of utilizing the assimilation process. If each of these ions influenced only one pair of the function factors then the application of nitrate fertilizer during the vegetation period would have to increase the yield, and following fertilization with superphosphate would have to lower the yield to a definite extent. Since, however, both ions influence several pairs of function factors, whose effect can be combined in various ways, both an increase and a decrease in yield can be obtained depending upon the time of applying the fertilizer and the reactivity of the plant. These results have been confirmed in field tests with potatoes. J. S. Reichert

The effect of radioactivity on the chlorophyll-containing and the non-chlorophyll-containing cells. Julius Stoklasa, Josef Penkava and Josef Bares. *Sbornik Ceskoslov. Akad. Zemedelske* **2**, 57–104; *Chem. Zentr.* **1927**, II, 945–6.—The authors prove that the presence of Rn streaming from the soil into the atm., by the emission of α-rays, greatly increases the intensity of respiration both in the chlorophyll-contg. and the non-chlorophyll-contg. cells, particularly with a content of 262–83 Mache units in the atm. The production of CO_2 is increased about 40–90%. The α-rays accelerate all the enzymic processes, if O_2 is present in sufficient quantities. The β- and γ-rays activate principally the glucolytic enzyme. These rays are also held responsible for the intensive respiration of the organisms which are rich in K. A decompn. of *carbohydrates* ensues with the formation of *lactic acid, alc.* and CO_2. The alc. gives rise to AcH and AcOH. The α- and β-rays have in some respects an opposite effect. The β-rays activate the surface and promote synthetic action, while the α-rays promote the decompn. of complexes and act destructively and probably by the isolation of org. Fe groups they promote oxidation. J. S. Reichert

The death wave in Nitella. I. Applications of like solutions. W. J. V. Osterhout and E. S. Harris. Rockefeller Inst. *J. Gen. Physiol.* **12**, 167–86(1928).—Expts. on injury of *Nitella* cells by cutting show that the current of injury will be positive when the cell is in contact with concd. solns. and negative in contact with dil. solns. of KCl. The results support the theory that protoplasm is composed of layers differing considerably in their properties, each having a death curve of simple, regular form. The more rapid alteration of the outer layer makes the protoplasm more positive; the more rapid alteration of the inner layer makes it more negative. From the point of injury a death wave passes along the cell, setting up at each point touched by it a death process which has the greater speed and intensity the nearer it is to the source of injury. C. H. Richardson

Spectrophotometric studies of penetration. IV. Penetration of trimethylthionine into Nitella and Valonia from methylene blue. M. Irwin. Rockefeller Inst. *J. Gen. Physiol.* **12**, 147–65(1928).—Spectrophotometric measurements show that the sap of these plant cells if placed in methylene blue soln. at p_H 9+ contain chiefly trimethyl-

thionine, irrespective of the time the measurements are taken. Methylene blue is present in the sap only when the cells are injured or when it enters at the time the sap is extd. The sap cannot demethylate methylene blue. It is uncertain whether the trimethylthionine has penetrated from the external methylene blue soln., which generally contains this dye as an impurity, or whether it is formed from methylene blue by the protoplasm. The theory is discussed on the basis of the more rapid penetration of trimethylthionine as free base than as methylene blue or trimethylthionine in salt form. Other contributions will follow. C. H. RICHARDSON

Positive and negative currents of injury in relation to protoplasmic structure. W. J. V. OSTERHOUT AND E. S. HARRIS. Rockefeller Inst. *J. Gen. Physiol.* **11**, 673–700(1928).—In simple, multinucleate cells of *Nitella*, the current of injury may be pos. or neg. With $CHCl_3$ in 0.1 *M* KCl it is pos. but with 0.001 *M* KCl it is neg. Each protoplasmic layer probably has a death curve of simple, regular form, the more rapid alteration of the outer layer producing a pos. current, the more rapid alteration of the inner layer, a neg. current of injury. C. H. RICHARDSON

Citric acid inversion of sucrose in plant tissues. J. E. WEBSTER AND C. DALBOM. Oklahoma Agr. and Mech. Coll. *Science* **68**, 257–8(1928).—In expts. using HCl, invertase and citric acid, resp., as hydrolyzing agents of the sucrose in grape stem and leaves and in the *Coleus*, the HCl with solns. contg. glucosides (grape stems) gave too high results, and with solns. contg. little of glucosides and only a trace of sucrose, gave too low results. Invertase failed to give consistent results. Citric acid was easy to use, consistent in results, and apparently did not hydrolyze glucosides nor destroy any of the invert sugar. L. W. RIGGS

The effect of ethyl alcohol on the turgor pressure of Spirogyra. V. V. LEPESCHKIN *Am. J. Botany* **15**, 422–4(1928).—Weak concns. of alc. decrease the turgor pressure of *Spirogyra* while strong concns. increase this pressure. The increasing effects of stronger concns. of alc. must be ascribed to a very strong rise of the concn. of cell sap of the alga. Its cell sap contains much tannin which forms a colloidal soln. in water, but the solns. of tannin in dil. alc. are mol. Alc. penetrates the cell sap, dissolves tannin molecularly and increases its mol. concn. The method of isotonic coeffs. shows that the decreasing effect of small concn. of alc. on the turgor pressure of *Spirogyra* is produced by the increase of the permeability of protoplasm. The results show that all narcotics lower permeability as narcosis is brought about by a slight chem. decompn. of the principal substances of protoplasm. J. J. SKINNER

Tobacco frenching—a nitrogen deficiency disease. W. D. VALLEAU AND E. M. JOHNSON. Ky. Agr. Expt. Sta., *Bull.* **28**, 179–253(1927); cf. *C. A.* **21**, 117.—Frenching of tobacco is a disease characterized by chlorosis of the leaf tissue between the veins or, in severe cases, the entire growing point may be chlorotic. In pot expts. the disease usually appears in the growing point at about the time N starvation begins to appear in the lower leaves. It is readily controlled by the addn. of N to the soil in any of the readily available forms as $NaNO_3$, KNO_3, urea, ammonia compds., etc. Control extends over a long or short period depending upon the amt. of N added. Pecan rosette, apple rosette, frenching of citrus and certain other chloroses present aspects so similar to frenching of tobacco as to suggest that they are diseases of the same nature. Fifty-two p. p. m. of NO_3 added every 2 weeks to soil in which plants were beginning to show N starvation was not sufficient to prevent frenching, while with the addn. of 104 p. p. m. at the same intervals the plants became dark green and did not french. Frenching has developed in sand cultures soon after the plants showed signs of N starvation. The addn. of 40 p. p. m. of NO_3 in sand was not sufficient to result in healthy plants while the addn. of 80 p. p. m. resulted in a healthy, dark green growth. Heating the virgin soil to 65° has the same effect on the growth of tobacco plants in pot cultures as the addn. of available N; the plants grow much larger before showing signs of N starvation than when grown in the unheated soil, and usually do not french, even after N starvation becomes prominent. CaO added to virgin soil in large quantities stimulated growth of tobacco plants over those in untreated soil and appeared to prevent frenching, although N starvation eventually developed in the lower leaves. The stimulation was much less than that resulting from heating the soil to 65°. Plants in soil to which CaO had been added grew more slowly, and developed N starvation in the lower leaves at about the same time as the others but gradually outgrew them and did not french. Evidence is presented which suggests that drouth spot, cork spot and bitter-pit of apples and blossom-end rot of tomatoes are diseases of the same general nature as frenching and are due to N starvation of the affected tissues. The theory is advanced that brown bark spot of apple and other trees is a disease due to N starvation. J. J. SKINNER

The growth of cotton in various nutrient solutions. HORACE J. HARPER AND HENRY F. MURPHY. Oklahoma Agr. Expt. Sta. *Soil Science* **26,** 139–45(1928).—A study was made of the growth of cotton plants in sand cultures to which 9 different nutrient solns. were added. In 3 different tests Tottingham's soln. produced the most satisfactory growth of cotton although in one instance Shive's soln. produced a slightly larger plant but did not produce a normal development of squares and bolls. Pfeffer's nutrient soln. produced a very satisfactory growth of cotton and because of its lower salt concn. may be preferable under certain conditions to either Tottingham's or Shive's soln. The utilization of rock phosphate by the cotton plant was very poor when substituted for monopotassium phosphate in Pfeffer's soln., even though a considerable amt. of insol. P was transferred to the sand culture when the soln. was added. Since the absorption of Fe by the cotton plants grown in different solns. was not in proportion to the amt. of Fe present in the soln., an excessive amt. of Fe in Crone's nutrient soln. does not explain the poor growth of cotton produced by that soln. A table is given showing the compn. of the nutrient solns. used. J. J. SKINNER

The selective absorption of inorganic elements by various crop plants. J. D. NEWTON. Univ. of Alberta. *Soil Science* **26,** 85–91(1928).—Sunflowers, beans, wheat, barley, peas and corn were grown in nutrient solns. and in a loam soil and their compns. detd. Plants grown in the culture solns. were richer in nutrients, Ca, K, Mg, N and P than plants in loam soil. Sunflowers were high in Ca and Mg and moderately so in K and P. Beans were high in Ca and Mg and moderately high in P and poor in K. Peas, barley and wheat were somewhat similar in org. elements. Corn was low in inorg. elements as compared to the other plants. J. J. SKINNER

Variations in the manganese content of certain vegetables. W. H. PETERSON AND C. W. LINDOW. Univ. of Wisconsin. *Soil Science* **26,** 149–53(1928).—The Mn in 22 samples of cabbage, 13 samples of green peas, 18 samples of string beans and 4 samples of tomatoes was detd. On the fresh basis the av. is as follows: cabbage 0.000076%, green peas 0.00032%, string beans 0.00034% and tomatoes 0.000091%. Variations of from 200 to 300% were found among the samples of each class of vegetables. These variations do not appear to be correlated with the type of soil in which the samples were grown. They are probably related to the amt. of available Mn in the soil rather than to the type of soil. No clearly defined relation seems to exist between the Mn content and the variety, size or date of harvest of the vegetable. J. J. SKINNER

Potato plants grown in mineral nutrient media. EARL S. JOHNSON. Univ. Maryland. *Soil Science* **26,** 173–6(1928).—Potato plants grown in sand and water cultures with B-deficient solns. did not develop normally. Plants grown in solns. contg. 0.55 p. p. m. B developed normally. J. J. SKINNER

Measurement of suction power in the seedling stage. KONRAD MEYER. Univ. Göttingen. *J. Landw.* **76,** 11–24(1928).—The app. described has proved accurate in suction-force measurements with a large no. of varieties of oats. The results which will be published later with other physiol. investigations show clearly differences in the osmotic values of the individual varieties and coincide throughout with our hitherto existing knowledge about the different water demands of the varieties. As the limit of concn. for oats the following must be considered. In the case of cane sugar 0.55–0.75 vol.-molar solns., for $CaCl_2$ 3.0–4.0%, for KNO_3 and $NaNO_3$ 3.5–4.5% solns. Oats show remarkably low suction powers, a result that agrees completely with the investigations of Merkenschlagers and Klinkowskis. E. F. S.

The determination of chlorophyll by Willstätter's method. K. MAIWALD. Univ. Breslau. *J. Landw.* **76,** 63–9(1928); cf. *C. A.* **22,** 796.—A criticism of Steche's modification of Willstätter's method and a description of the procedure recommended. E. F. SNYDER

The determination of chlorophyll by Willstätters method. THEODOR STECHE. *J. Landw.* **76,** 71–3(1928); cf. *C. A.* **22,** 796.—A reply to Maiwald (cf. preceding abstr.). E. F. SNYDER

Chemical treatments for shortening the rest period of plants. F. E. DENNY. Boyce Thompson Inst., Yonkers, N. Y. *J. Soc. Chem. Ind.* **47,** 239–43T(1928); cf. *C. A.* **22,** 3014, 3194.—D. describes the use of ethylene chlorohydrin and the thiocyanates of Na, K and NH_4 for shortening the rest period of plants. E. F. S.

Differential staining of specialized cells in Begonia with indicators. DEAN H. ROSE AND ANNIE M. HURD-KARRER. Bur. of Plant Ind. *Plant Physiology* **2,** 441–53 (1927).—When freshly cut tissues of leaves, petioles and young stems of *Begonia* were immersed in 0.2% solns. of bromocresol green, H-ion concns. corresponding to at least p_H 1.5 were indicated. This acidity corresponds to that obtained by electrometric

titrations of the *expressed plant juice.* Since chem. changes occur that result in a decrease in the cell acidity of most of the cells when they are exposed to air, the usual method of vital staining by immersion of cut sections in solns. of indicators is not reliable for tissues such as those of *Begonia.* Two physiologically different types of cells are present, as is shown by their different behavior toward bromocresol green and also toward the oxidase reagents benzidine and gum guaiacum. The "specialized" cells contg. CaC_2O_4 do not change color in the acid indicator soln. Oxidase is present in the "specialized" cell but not in the rest of the tissue. The oxidase reactions do not take place when the reagents are added to the *expressed juice,* apparently indicating that in uninjured cells the enzymes are not in contact with the acid sap. W. T.

The effect of boric acid on the growth of tobacco plants in nutrient solutions. T. ROBERT SWANBACK. Mass. Agr. College. *Plant Physiology* **2**, 475-86(1927).—Pot culture expts. with Shive's 3-salt soln. (*C. A.* **15**, 3659) indicated that B is an essential element for the growth of the tobacco plant. Increasing concns. of H_3BO_3 up to 400 p. p. m. caused slight injury. Optimum growth in the above culture soln. was obtained by the addn. of 2 p. p. m. of H_3BO_3. WALTER THOMAS

Notes on apparatus for low temperature respiration studies. J. H. BEAUMONT, J. J. WILLAMAN AND W. A. DELONG. Univ. of Minnesota. *Plant Physiology* **2**, 487-95(1927).—The thermostat, respiration chamber, absorption unit, circulation mechanism and heat-control mechanism of an app. successfully used in studies on respiration of apple twigs in relation to winter hardiness are described in detail with the use of 6 diagrams. WALTER THOMAS

Variation of the water content of leaves in relation to the wilting of plants. RIICHIRO KOKETSU. Kyushu Imp. Univ. *Proc. Imp. Acad.* (*Japan*) **4**, 229-30(1928).—The ratio between the H_2O content at the time of critical wilting and that at full turbidity is probably sp. for a given plant when cultivated in a given soil. C. J. W.

Anthocyanin pigments of morning glory. II. TAKEO KATAOKA. Imp. Expt. Sta., Tokyo. *Proc. Imp. Acad.* (*Japan*) **4**, 389-92(1928); cf. *C. A.* **22**, 1652.—The sugar-free pigment of the morning glory (*Pharbitis nil,* Chois.) is shown to be pelargonidin. C. J. WEST

Ultra-violet absorption spectrum of chlorophyll in alcoholic solution (LEWKOWITSCH) 3.

E—NUTRITION

PHILIP B. HAWK

Vitamin studies. XV. Assimilation of vitamins A and D in presence of mineral oil. R. ADAMS DUTCHER, J. O. ELY AND H. E. HONEYWELL. Penn. State College. *Proc. Soc. Exptl. Biol. Med.* **24**, 953-5(1927); cf. *C. A.* **22**, 255.—Mineral oils possess the property of dissolving vitamin A from food materials and when given internally they deprive the body of this factor. The calcifying potency of cod-liver oil was not appreciably affected by the presence of mineral oil. Rats were used. C. V. B.

Occurrence of deciduomata in rats low in vitamins A and E. K. SCOTT BISHOP AND AGNES FAY MORGAN. Univ. of California. *Proc. Soc. Exptl. Biol. Med.* **25**, 438 (1928).—In 1 rat of a series maintained on A-low diets, multiple deciduomata occurred spontaneously. This rat was never mated. At 5 months of age it was transferred from a diet low in A to one free from A and low in E. Cornification of the vaginal cell content became complete at once and persisted for 15 days when 2 drops of cod-liver oil were given daily, producing a normal vaginal cell content, although no estrus occurred after the cure. Fourteen days later vaginal blood was noted and autopsy was performed. In another series of E-free rats, persistence of the decidual reaction occurred in those showing resorption of embryos before the 10th day of pregnancy, either when A also was low, or when several matings (and reabsorptions) followed each other without rest periods. C. V. B.

Studies on hemoglobin formation in the rat. GEORGE F. CARTLAND AND F. C. KOCH. Univ. of Chicago. *Proc. Soc. Exptl. Biol. Med.* **25**, 447-9(1928).—Wheat gluten is an adequate dietary protein for promoting hemoglobin synthesis in the rat. Casein is not superior to wheat gluten for this purpose. Hemoglobin and tryptophan in the diet are no better utilized than gluten for this purpose. The blood-forming process in the rat is not dependent upon the presence of vitamins A, B or E in the diet. C. V. B.

The effects of synthetic diets on fertility and lactation. E. TSO. *Proc. Soc. Exptl. Biol. Med.* **24**, 465-8(1927).—Eight synthetic diets are given, with a record of the effects of these diets on fertility and lactation in the rat. C. V. B.

Rickets in rats. V. Comparison of effects of irradiated ergosterol and cod-liver

oil. ALFRED T. SHOHL, HELEN B. BENNETT AND KATHARINE L. WEED. Yale University. *Proc. Soc. Exptl. Biol. Med.* **25**, 551–4(1928); cf. *C. A.* **22**, 3685.—Marked cure of rickets in rats is secured in 2 weeks by feeding cod-liver oil or 0.01 mg. daily of irradiated ergosterol. This is shown by histological prepns. of the bones, the analyses of the blood serum for Ca and P and the ash analyses of the bones. The metabolism studies demonstrate that the cure is accomplished without great increase in the retention of Ca or P. **VI. Effect of phosphate added to the diet of non-ricket rats.** *Ibid* 669–71.—Rachitic rats develop tetany and have high P and low Ca in the blood serum when moderate amts. of phosphate are added to the diet. Rats fed with the same diet, plus antirachitic vitamins, show neither tetany nor an alteration in blood Ca and P and their bones yield a normal amt. of ash. (Cf. following abstr.) C. V. B.

Rickets in rats. VII. Metabolism of calcium and phosphorus of rats fed upon non-ricketogenic diets. ALFRED SHOHL, HELEN B. BENNETT AND KATHARINE L. WEED. Yale Univ. *J. Biol. Chem.* **79**, 257–67(1928); cf. preceding abstr.—Expts. have been conducted in which a rickets-producing diet was modified toward normal by the addn. of salts and vitamins, only one alteration being made at a time so that the effect of the deficiency could be estd. stepwise. Improvement occurred in the growth of animals, in the character of the bones, and in retention of Ca and P and this improvement was brought about primarily by the increase in food consumption. The best results were obtained when the diet was supplemented both with cod-liver oil and by irradiation. **IX. p_H of the feces.** ALFRED T. SHOHL AND FRANKLIN C. BING. *Ibid* 269–74.—Alteration in the feces from alk. to acid occurs when rats fed on Zucker's diet are cured of rickets by cod-liver oil. This change, however, does not occur when rats made rachitic on Steenbock's diet are cured by irradiation of the food or by addn. of alk. phosphates. The cure of rickets, therefore, is not necessarily assocd. with an alteration of the p_H of the feces from alk. to acid although the change is of great interest in interpreting the mechanism of the action of cod-liver oil. A. P. LOTHROP

Dietary requirements for fertility and lactation. XVI. Potency of "Vitavose" versus dehydrated yeast in vitamin B. BARNETT SURE. Univ. of Arkansas. *Proc. Soc. Exptl. Biol. Med.* **25**, 603–5(1928); cf. *C. A.* **22**, 2192.—"Vitavose" compared with dehydrated brewer's or baker's yeasts was a complete failure as the only source of vitamin B for lactation. C. V. B.

Histologic effects of a cholesterol-free diet on adult white rats. W. M. BALDWIN. Albany Med. Coll. *Proc. Soc. Exptl. Biol. Med.* **25**, 646–8(1928).—A series of white rats was raised upon a cholesterol-free diet over a period of 3 generations; it was concluded that cholesterol was to a certain extent built up by the rat body. The rats of the third generation were weak, small and undernourishd and died at 11 to 17 weeks of age. At autopsy there was no evidence of inflammation or degeneration in any of the body tissues. The organs were reduced in size by a decrease in size rather than in no. of the cells forming them. The cytoplasm had suffered greater loss in size than the nucleus. A striking variation in the size of the nuclei of the liver cells was observable. The ovaries contained no corpora lutea and the ova were small. The follicular cells suffered a marked reduction in no. In the testis the cells lining the seminiferous tubules were reduced in no. The spermatozoa, spermatids, spermatocytes and column cells of Sertoli were absent, small spermatogonia being present. Interstitial cells were small. Certain cells were absent in the adrenals; others were small. C. V. B.

Vitamin A in relation to growth and to subsequent susceptibility to infection. H. C. SHERMAN AND M. P. BURTIS. Columbia Univ. *Proc. Soc. Exptl. Biol. Med.* **25**, 649–50(1928).—The larger the exptl. animal the greater the amt. of vitamin A needed to maintain a given rate of growth. Expts. also show that the level of intake of vitamin A during early life may markedly influence subsequent susceptibility to infection. C. V. B.

Effect of cholesterol exposed to Röntgen rays on rachitic rats. WILHELM STENSTROM, ANNE LOHMANN AND H. T. HILLSTROM. Univ. of Minnesota. *Proc. Soc. Exptl. Biol. Med.* **25**, 817–9(1928).—The Röntgen radiation of a soln. of 0.6% cholesterol in $CHCl_3$ for 1 to 15 hrs. did not induce any antirachitic potency in the cholesterol. C. V. B.

Avitaminosis. Behavior of some blood enzymes in avitaminosis. Antitryptic action of serum in experimental avitaminosis. F. GENTILE. *Arch. fisiol.* **25**, 21–32, 33–42(1927).—In pigeons (with exptl. beriberi diet) and guinea pigs (with diet free from vitamin C) the glucolytic power of the blood is decreased; in hunger the blood glucolysis is greatly increased. The catalase value for guinea pigs (on a scorbutic diet) sinks at first, and then gradually rises to and above the normal. With pigeons fed with polished rice there is a considerable rise in the antitryptic enzyme content, with a fall on the ap-

pearance of symptoms. With guinea pigs there is an increase of tryptic enzyme on scorbutic diet, and a diminution in hunger. B. C. A.

Antirachitic action of irradiated ergosterol. SIM KI AY. *Mededeel. Rikjs-Inst. pharm. therapeut. Onderzoek* **1927**, 128–31; *Chem. Zentr.* **1927**, II, 1587.—Clinical expts. on children 7–24 months old gave favorable results. The control expts. were carried out with cod-liver oil. C. C. DAVIS

Vitamins in our food. G. SCHMICH. *Zentr. Gewerbehyg. Unfallverhüt* **14**, 178–80; *Chem. Zentr.* **1927**, II, 711.—A short discussion of the vitamin content of various foods. C. C. DAVIS

The vitamin content of the root vegetables which are important as food. ARTHUR SCHEUNERT. Univ. Leipzig. *Z. Zuchtungskunde* **2**, No. 5, 14 pp.; *Chem. Zentr.* **1927**, II, 2021.—Beets, turnips and turnip-root cabbage from the 1925 and 1926 harvests were analyzed for their vitamin content. Vitamin A was present only in turnip-root cabbage and in very small content. All 3 vegetables contained vitamin B in small content. Sugar beets contained a higher vitamin B content that that of ordinary beets raised for food. The vitamin C content of beets was very low, but was surprisingly high in turnips and turnip-root cabbage; in fact, the vitamin-C content of these 2 vegetables is comparable with that of oranges, lemons and tomatoes. C. C. DAVIS

Vitamin. HANS MAUTNER. *Wiener klin. Wochschr.* **41**, 1315–9(1928).—A general discussion. D. B. DILL

The green pigment eliminated with the urine by albino rats fed special proteins. A. GALAMINI. *Arch. farmacol. sper.* **45**, 215–7(1928).—When albino rats are fed an exclusive diet of coagulated egg white or dried fish a green pigment appears in the urine after about a month. If EtOH is administered simultaneously the pigment appears much sooner. Addn. of butter or starch to the diet prevents the pigment formation. The pigment is excreted as a chromogen which rapidly oxidizes in contact with the air to a green substance. If the urine is covered with PhMe the color gradually disappears but returns when air is admitted. The color gradually disappears in the presence of acid but reappears when the acid is neutralized. Tests for bile pigments were negative. Exclusive diets of meat or cheese failed to cause pigment formation even when EtOH was administered. A. W. DOX

Determination of the antiscorbutic value of foodstuffs by Höjer's method. MARIANNE GOETTSCH. *J. Pharm. Soc.* **1**, 168–77(1928).—The presence of scurvy in guinea pigs may be detected by histological changes in the incisor root. By Höjer's method of assay of the antiscorbutic potency of a substance, it is possible to det. the min. protective dose of that substance; but such variations occur within a group of animals on any one inadequate level of orange juice, that the value of an inadequate dose cannot be detd. without the use of great numbers of animals. By this method special feeding need be carried on for only 2 weeks instead of 8 as in the other method; hence, there is less danger of animals dying from causes other than scurvy in the course of the test. Less than 2 weeks is required for the prepn. of the teeth for microscopical study, so that information as to the antiscorbutic value of a foodstuff may be obtained in about 4 weeks' time. In an appendix to this article, Kathleen M. Key has given details of the technic of the Höjer method. W. O. E.

Some properties of ergosterol. FRANK WOKES AND STANLEY GORDON WILLIMOTT. Univ. Liverpool and Biochem. Lab. Cambridge. *J. Pharm. Soc.* **1**, 188–93(1928).—Ergosterol prepd. from yeast gives with $SbCl_3$ blue colors very like the "vitamin" colors given by the same reagent on cod-liver oil. Quant. estn. of these colors by means of the Lovibond tintometer showed the intensity of initial blue color produced under standard conditions to run roughly parallel with the concn. of ergosterol. Feeding expts. on the ergosterol failed to reveal the presence of vitamin A. Spectroscopic examn. of the colors has given evidence of a difference in the characteristic absorption bands in the ergosterol blue as compared with the "vitamin" blue. Examn. of samples of ergosterol contg. different amts. of zymosterol indicates that the blue color is not due to the latter sterol, which is now known to be present in all samples of ergosterol prepd. from yeast fat. W. O. E.

Trypsin secretion of infants. T. LUKACS. *Am. J. Diseases Children* **31**, 235–40 (1926); *Physiol. Abstracts* **11**, 218.—It has been shown previously that pancreatic amylase and lipase are increased in rickets. L. investigated the trypsin content of the stools of 231 infants by the Gross-Fuld method, and found that in all cases of infectious disease the trypsin was decreased, but that in rickets it was increased. He suggests that the reabsorbed trypsin may produce some degree of protein poisoning which may be the cause of some of the symptoms of rickets. H. G.

Insulin in malnutrition. L. Fischer and J. L. Rogatz. *Am. J. Diseases Children* **31,** 363–72(1926).—From observations on 27 malnourished infants the authors conclude that insulin treatment is effective in cases showing anemia, apathy and loss of weight. H. G.

Acidified milks. H. K. Faber. *Am. J. Diseases Children* **31,** 395–409(1926); *Physiol. Abstracts* **11,** 220.—A consideration of the effects of acid feeding on enzyme action and metabolism shows that acidified milk may be a useful therapeutic agent for certain sp. disorders, but should be given only when there are sp. indications and for periods of time limited by the regression of symptoms. The routine use of sour milk in feeding normal infants is not to be encouraged. H. G.

Metabolism of under-nourished children. III. Urinary nitrogen, with special reference to creatinine. C. C. Wang, M. Frank, R. Kern and B. B. Hays. *Am. J. Diseases Children* **32,** 360–6(1926); *Physiol. Abstracts* **12,** 48.—Creatinine N increased with increasing body weight and with age; creatine occurred in all the 26 children examd. NH_3 and total N were fairly const. The creatinine coeff. ranged from 5.5 to 9.5, and the creatinine excretion for the same child remained very const. H. G.

Calcium metabolism studies. W. A. Price. *Am. J. Diseases Children* **33,** 78–95 (1927); *Physiol. Abstracts* **13,** 93–4.—Expts. with chicks show that cod-liver oil and cholesterol are both changed by sunshine, over-exposure causing deleterious effects; the administration of irradiated cod-liver oil by rubbing it on the neck increases the C content of the blood and of the local tissue fluid. The effect may be related directly to the utilization of the Ca from the food, or to the Ca soly. Dental caries is directly influenced by the administration of activators of Ca metabolism. H G

Studies on experimental rickets. XXVIII. Does vitamin D pass into the milk? E. V. McCollum, N. Simmonds, J. E. Becker, and P. G. Shipley. *Am. J. Diseases Children* **33,** 230–43(1927); *Expt. Sta. Record* **56,** 796–7.—To det. whether it is possible for nursing women to increase the vitamin D content of their milk by taking cod-liver oil and, if so, when the treatment should begin and how long it should be continued, a series of feeding expts. in continuation of the studies previously noted (*C. A.* **21,** 118) was conducted upon female rats, with the addn. of suitable amts. of cod-liver oil to a basal diet supposedly adequate in all respects except for a deficiency in vitamins A and D. A parallel series of expts. was run with butterfat in place of cod-liver oil for the purpose of detg. whether a diet complete in every respect except vitamin D is capable of producing milk with protective value against rickets. The entire time covered in any one expt. extended from about a month before mating until the young were eating the mother's diet, but the individual periods were varied to cover one or all of the periods before mating and during pregnancy and during lactation before and after the young eat of the mother's food. When the rats were fed cod-liver oil before mating, during pregnancy and during the first 2 weeks of nursing, considerable protection against rickets in the young was afforded, but not as much as when the young were continued on the cod-liver oil ration. When the cod-liver oil was fed only during the first weeks of the nursing period, there was very little protection against rickets. No protection was afforded by the butterfat diet. These expts. are thought to demonstrate that the vitamin D of cod-liver oil does pass into the mother's milk, but that to insure a considerable amt. of this vitamin the diet should be supplemented by cod-liver oil during pregnancy as well as lactation. H. G.

Inorganic blood phosphate. E. M. Koch and M. H. Cahan. *Am. J. Diseases Children* **34,** 187–97(1927); *Physiol. Abstracts* **13,** 80; cf. *C. A.* **21,** 2149.—Growing and mature rats were fed on McCollum's rachitic diet and the inorg. blood phosphate was detd. by Brigg's modification of the Bell-Doisy method; in both groups the phosphate was lowered. Irradiation raised the phosphate value for mature rats, but not for the young ones, while the addn. of cod-liver oil to the rachitic diet raised the phosphate in both. The addn. of irradiated cholesterol prevented the development of rickets and caused a concn. of phosphate; non-irradiated cholesterol had no effect as a preventive of rickets, but tended to bring the phosphate up to normal in both young and mature rats. Thus cod-liver oil, direct irradiation, and feeding with irradiated cholesterol all raise the blood phosphate almost to normal, and it is possible to have a low phosphate value and low product of Ca and P with apparently perfect bone calcification. H. G.

Antirachitic properties of irradiated dry milk. G. C. Supplee and O. D. Dow. *Am. J. Diseases Children* **34,** 364–71(1927); *Physiol. Abstracts* **13,** 94; cf. *C. A.* **21,** 3071; **22,** 104.—Expts. carried out with rats show that irradiation of dried milk with ultra-violet rays increases its nutritive and therapeutic properties, provided that over-exposure to rays of short-wave length is avoided. No measurable destruction of the

easily oxidized vitamins A and C occurs in the process, and there is no production of disagreeable taste or odor such as occurs with ordinary milk products. H. G.

Gastric digestion. The relation of the hydrogen-ion concentration, volume and buffer capacity of the gastric contents to a milk test meal. R. B. MILES AND A. T. SHOHL. *Am. J. Diseases Children* **34**, 429–42(1927); *Physiol. Abstracts* **13**, 91.—Careful observations made on 2 female infants (6 months old and 8 months) show that meals combining small vol. and low concn. of buffer substances are the most easily digested; such meals require only a relatively small quantity of acid gastric juice to bring them to the p_H optimal for digestion. The effects of varying the relative values of the 3 factors are discussed. H. G.

The food values of New Zealand fish. VII. The vitamin content of the tarakihi (Chilodactylus macropterus). J. MALCOLM. *Trans. Proc. New Zealand Inst.* **57**, 879–80(1926); *Physiol. Abstracts* **13**, 95; cf. *C. A.* **21**, 3990.—The flesh of the parboiled fish, contg. an av. of 20% protein and 6% fat, was made up in 100 g. packets and kept in cold storage. Other quantities were dried. With protein as a criterion of the amt. of fish used, fish diets were made with the proximate principles always in the same proportions as in the basal diet, but with 5, 10, 15 or 20% (all) of the casein replaced by fish protein, allowance being made for the accompanying fat, extractives, etc. With the frozen material the rats grew up to 100 g. in one litter at the 5% fish-protein level but in general 15% was necessary. Less marked but still good results were obtained with dried fish. (Vitamin D was not distinguished from vitamin A in these expts.) H. G.

Studies on artificial feeding of infants. T. SUZUKI. Kyoto Imp. Univ. *Oriental J. Diseases of Infants* **2**, 1–10(1927); *Bull. Hyg.* **3**, 579(1928).—Rats developed better on dried than dextri-malted milks. A repetition on a group of children gave the same results. GEORGE R. GREENBANK

General inhibition of growth by an experimental change in the carbohydrate catabolism. HERBERT HENTSCHEL. *Klin. Wochschr.* **7**, 1086–8(1928).—Young rats remain quite well, but do not grow, in an atm. of 95.5% O and 4.5% CO_2. The lactic acid content of such rats is less than half that of rats that have been raised in air. The high O content prevents glucolysis with formation of lactic acid; and lactic acid is essential for cell growth. MILTON HANKE

Formation of antirachitic vitamin in the absence of light. A. SCHITTENHELM AND B. EISLER. *Klin. Wochschr.* **7**, 1118–9(1928).—Barley does not contain vitamin D. Barley that has been allowed to germinate in the dark contains vitamin D. Ergosterol could not be demonstrated. Provitamin D was not present. M. H.

Beneficial results in vitamin therapy with the health nutrient "Alentina." The theoretical foundation for the use of Alentina. A. SCHITTENHELM. Med. Clinic, Kiel. *Klin. Wochschr.* **7**, 1214–20(1928).—The early germination of barley, or of other cereals, leads to the formation of root processes that contain vitamins A, B, D and E. These processes can be dried and powd. without injuring the vitamin. The powder contains about 30% of N-contg. substances and has a low fat content. A powd. yeast can be prepd. (process not given) that is odorless, has a pleasant taste and contains, besides vitamins, 60% of protein and 7% of inorganic constituents rich in P. Alentina is a mixt. of the above 2 powders with nutrient malt flour and flavoring materials. Case reports are given to show the beneficial action of Alentina. MILTON HANKE

The vitamin content of the nutrient preparation, "Promonta." H. STEUDEL AND P. N. SCHÜRHOFF. *Klin. Wochschr.* **7**, 1605(1928); cf. L. Bitter and F. Weigmaun, *Klin. Wochschr.* **7**, 1329–30(1918).—Promonta is a valuable vitamin-contg. prepn. It does not contain vitamin C, which is not surprising in a dried product. It is unusually free from bacteria; 0.1 g. contains only about 10 bacteria. The dose used by B. and W. was too small (0.5 g.). The comm. 2 g. tablets are recommended. MILTON HANKE

Vitamin D in adults. Its effect on the calcium and inorganic phosphate of the blood. R. E. HARVARD AND J. C. HOYLE. Biochem. Lab., Cambridge. *Biochem. J.* **22**, 713–6(1928).—Adding 8 mg. per day of irradiated ergosterol to the diet of a healthy adult for 21 days during the winter showed no change in the blood inorg. phosphate or serum Ca. No better results were obtained by irradiation with C arc lamps for a period of 16 days during the winter. BENJAMIN HARROW

Specificity of ergosterol as parent substance of vitamin D. OTTO ROSENHEIM AND THOMAS ARTHUR WEBSTER. National Institute for Medical Research, Hampstead, London. *Biochem. J.* **22**, 762–6(1928).—See *C. A.* **22**, 3200. BENJAMIN HARROW

Antiscorbutic fraction of lemon juice. VII. SYLVESTER S. ZILVA. Lister Inst., London. *Biochem. J.* **22**, 779–85(1928); cf. *C. A.* **21**, 3072.—Phenolindophenol (*B*) added to decitrated lemon juice (*A*) until the indicator is no longer reduced and adjust-

ing the p_H to 7 destroys the antiscorbutic activity (*C*) in 24 hrs. Purified antiscorbutic fractions lose their activity more rapidly than (*A*). (*A*) dialyzed in collodion thimbles of a permeability which leaves the soln. inactive after 3 days loses the capacity for reducing (*B*). The reducing capacity is largely retained by the juice when dialyzed in thimbles of a permeability which yields an active juice at the end. Acidity retards the deterioration of (*C*). Autoclaving at 40 lb. pressure (143°) for 1 hr. under anaerobic conditions causes little loss in the activity of (*A*). BENJAMIN HARROW

Dual nature of water-soluble vitamin B. II. The effect upon young rats of vitamin B_2 deficiency and a method for the biological assay of vitamin B_2. HARRIET CHICK AND MARGARET HONORA ROSCOE. Lister Institute, London. *Biochem. J.* **22,** 790-9 (1928); cf. *C. A.* **21,** 3073.—Vitamin B_1 is the antineuritic factor and is less heat-stable; vitamin B_2 is the more heat-stable modification. In the absence of vitamin B_2 the animal fails to grow. Vitamin B_2 is present in pptd caseinogen and can be removed by thorough extn. with water acid and acid alc. As a source of vitamin B_1 the antineuritic concentrate of Kinnersley and Peters (*C. A.* **20,** 436; **22,** 447) is used. B. H.

Studies on color tests for sterols and vitamin A. I. Sterol tests. FRANK WOKES. Univ. of Liverpool. *Biochem. J.* **22,** 830-5(1928). Pure cholesterol (1), freed from ergosterol, gives with the "vitamin" reagents (concd H_2SO_4, $AsCl_3$, $SbCl_3$) (*A*) red colors persisting for many hrs. Similar results are obtained with cholesteryl acetate (2) and chloride (3), α-cholesterylene (4), cholestene (5), and Ψ-cholestene (6). (1), (2), (3), (5) and (6) in $CHCl_3$ soln., left in contact with concd. H_2SO_4 for some hrs., and then dild. with more $CHCl_3$, gives a purple or violet color. No colors are produced by CH_2O alone and $CHCl_3$ solns. of (1) or its derivs. which have not been in contact with concd. H_2SO_4. Irradiation of sterol derivs. generally has the effect of rendering the colors more transient. Activation with Ac_2O, Bz_2O_2, or CH_2O may lead to blue or purple color when (*A*) is added; cholestenone, which has been suggested as a typical product of irradiation, gives transient red colors with (*A*) and negative results with all other tests. $SbCl_5$ gives the color sequence red—blue—red with all cholesterol derivs. except the oxidation products with ordinary concns. of ergosterol. (*A*) gives the usual red, but at higher concns., the red changes to purple or blue. Sitosterol gives results similar to those with cholesterol, but more slowly. BENJAMIN HARROW

Effect of inanition and vitamin B deficiency on the adrenal glands of the pigeon. GUY F. MARRIAN Univ. College, London. *Biochem J.* **22,** 836-44(1928).—The results obtained by Marrian, etc (*C. A.* **22,** 1178) showing that adrenal hypertrophy occurred in starving pigeons receiving vitamin B and also in pigeons forcibly fed on an artificial vitamin B-free diet have been confirmed. The hypertrophy in the vitamin-deficient pigeons appears to be due to a deficiency in vitamin B_1. B. H

The metabolism of fats in infancy. PHILIP S. POTTER. *Arch. Pediatrics* **45,** 483-90(1928).—A review with bibliography. JOSEPH S. HEPBURN

Experiences with banana feeding in infants. L. VON MEYSENBUG. *Arch. Pediatrics* **45,** 509-13(1928).—Thoroughly ripe and macerated banana may be fed as early as the 4th month. It is curative in scurvy, may stimulate the appetite, and is of especial value in nephritis since it contains only approx. 0.4% protein. JOSEPH S. HEPBURN

The metabolism of carbohydrates in infancy. PHILIP S. POTTER. *Arch. Pediatrics* **45,** 514-25(1928).—A review with bibliography. Sections are devoted to absorption, blood sugar, N retention, lactose, sucrose, maltose and starch. J. S. H.

Maintenance and production requirements of ewes and lambs. T. B. WOOD AND W. S. MANSFIELD. *J. Ministry Agr.* **35,** 211-9(1928). E. H.

Absorption of ingested proteins in human beings. The absorption of unaltered fish proteins in adults. MATTHEW BRUNNER AND MATTHEW WALZER. Jewish Hospital, Brooklyn, N. Y. *Arch. Internal Medicine* **42,** 172-9(1928); cf. Walzer, *J. Immunol.* **14,** 143(1927); *Am. J. Med. Sci.* **173,** 279(1927); *Arch. Dermatol. Syphilis* **17,** 659(1928).—Out of 65 persons 15-70 years old 93.8% showed absorption of unaltered fish protein from the digestive tract. The wheal appeared within 15 min. in 50% and within 30 min. in 83.3% of the subjects. The reaction is delayed or prevented in atopic patients or members of certain atopic families, further, if the herring had been baked or cooked or taken on a full stomach The reaction is materially hastened by 3.9-7.8 g. $NaHCO_3$ before the fish ingestion. Hand and forearm are less sensitive than arm and thigh. The negative reaction in a patient with hookworm disease was caused by true impermeability of the entire alimentary tract to egg and fish albumin. M. J.

Irradiated ergosterol in the therapy of rickets. G. GENOESE AND A. ZALLOCCO. *Pediatria Rivista* **36,** 917-24(1928).—Expts. with 20 rachitic children 6-18 months old showed that the effect of irradiated ergosterol in rickets is slow and far behind that claimed by German authors. It has no advantage over direct ultra-violet treatment

or Zuke's cod-liver oil ext. A strikingly rapid improvement and complete recovery in 4 weeks were effected by a combination of irradiated ergosterol and *thyroid*. A review of the literature is included. MARY JACOBSEN

The vitamin content of olive oil irradiated with ultra-violet rays. GUIDO RIGOBELLO. *Rev. sud-americana endocrinol. immunol. quimioterap.* **11**, 456–66(1928). (In Italian.)—Rats were kept on McCollum's diet 3143 or a modified diet of the Ist. Biochim. Italiano with the addn. of orange juice, brewer's yeast and 5% olive oil irradiated by a Hanau Hg lamp at a distance of 40 cm. in a 5-mm. layer during 35–40 min. Excess irradiation destroys the protective power. The fluorescence of the oil is not affected by the irradiation. The bone calcification of rats receiving irradiated oil was almost normal and 25% higher than that of the controls. Very young rats also show an increase of bone growth, which, however, differs from normal (Röntgen). There is a general increase in wt. Severe cases of avitaminosis are improved and death is prevented. In view of the complicated picture and partly unknown course of human rickets it would not be correct to call the effect antirachitic. MARY JACOBSEN

Urobilinogen and urobilin excretion in the stool after fat and lean foods. HUGO SALOMON. *Arch. Verdauungskrankh.* **42**, 572–4, 575–8(1928); cf. *C. A.* **21**, 1295.—S. reports an increase in urobilinogen and urobilin excretion due to a fat-rich diet. There is also an increase of urobilinogen and urobilin excretion in the stool after "schlackenreiche" foods. FRANCES KRASNOW

The single test-breakfast investigation as the best method for the clinical test of gastric function. JACOB KAUFMAN. *Arch. Verdauungskrankh.* **43**, 230–43(1928). FRANCES KRASNOW

Diet in heart and kidney diseases. J. R. DARMALL. *J. Philippine Islands Med. Assoc.* **8**, 50–2(1928).—Discussion. FRANCES KRASNOW

The nature of the anestrous condition resulting from vitamin B deficiency. A. S. PARKES. Univ. Coll., London. *Quart. J. Exptl. Physiol.* **18**, 397–401(1928).—A deficiency in vitamin B represented by 1% or less of yeast ext. added to a basal diet brings about an abrupt cessation of the estrous cycle in rats in about 4 weeks. The anestrus so produced, which begins just before the characteristic decline in wt. appears, applies both to ovarian and extra-ovarian phenomena of estrus, and is terminated at any time up to 2 months later by death. Injection of estrin (10 m. u.) during the anestrous state results in the induction of estrous symptoms in the accessory organs. The anestrus due to this deficiency results not from inability of the animal to respond to the estrus-producing stimulus but from failure to produce estrin. FRANCES KRASNOW

Effect of diets deficient in vitamin A or B on resistance to paratyphoid-enteritidis organisms. ELIZABETH VERDER. Univ. of Chicago. *J. Infectious Diseases* **42**, 589–604(1928).—Deficiency in vitamin B of the diets of rats does not render the intestinal tract permeable to *B. enteritidis* but it does seem to raise the level at which the organisms live and multiply in the intestinal tract. *B. enteritidis* fed to rats on diets deficient in vitamin A (also deficient in vitamins D and E) was isolated from the spleen of these animals and found in the intestinal tract at higher levels than normally. J. H. L.

A comparison of the Bergeim and standard methods of determining coefficients of utilization with suggested modifications. V. G. HELLER, C. H. BREEDLOVE AND W. LIKELY. Okla. Agr. and Mech. Coll. *J. Biol. Chem.* **79**, 275–82(1928).—Standard utilization methods are of value only in limited studies as they are very time-consuming and accurate only within limits. The Bergeim method (*C. A.* **20**, 3718) gives results comparable to the older methods but usually some of the added Fe is not recovered and sampling of any portion of the feces at random does not give uniform samples as it is exceedingly doubtful whether the Fe_2O_3 is eliminated in like proportion in all parts of the feces. Most rations contain sufficient Fe to make addn. unnecessary and such a procedure provides a more uniform intake and a more evenly distributed Fe excretion in feces. The suggested detn. of the coeffs. of utilization is as follows: A uniform mixt. of the food to be studied is fed for 2 weeks prior to the time of analysis and samples of feces are collected daily over a considerable period of time and are rapidly dried and preserved. One g. samples of feed and 0.5 g. samples of feces are analyzed for Fe. The other constituents of feed and feces are detd. by the customary methods and the coeffs. of utilization calcd. as suggested by Bergeim. A. P. LOTHROP

A comparison of raw, pasteurized, evaporated and dried milks as sources of calcium and phosphorus for the human subject. MARTHA M. KRAMER, ESTHER LATZKE AND MARY M. SHAW. Kansas Agr. Expt. Sta. *J. Biol. Chem.* **79**, 283–95(1928).—The child retains more Ca when it is supplied in fresh milk than when it is furnished in equiv. amts. of dried milk. The 5 children were not given evapd. or pasteurized milks. In adults more favorable Ca balances were obtained with fresh and evapd. milks than

with pasteurized and dried milks. The results with evapd. milk were at least as good as with fresh milk. Milk from cows kept in the barn was not as satisfactory as that from cows on pasture. In general the P balances followed the trend of the Ca figures.
A. P. Lothrop

The mechanism of epinephrine action. I. The influence of epinephrine on the carbohydrate metabolism of fasting rats, with a note on new formation of carbohydrates. Carl F. Cori and Gerty T. Cori. State Inst. for the Study of Malignant Disease, Buffalo, N. Y. *J. Biol. Chem.* 79, 309-19(1928).—In fasting rats performing muscular work there is a diminution of only 22 mg. of glycogen between the 24th and 48th hr. of fasting. This constancy of glycogen content is probably due to the new formation of glycogen from non-carbohydrate material as fast as it is used up. It is suggested that the term "gluconeogenesis" should be reserved for cases where the sugar formed from non-carbohydrate sources becomes stabilized and should not be used for carbohydrate formation from protein or fat as an intermediary step in the complete oxidation of these mols. Injection of epinephrine does not change the respiratory quotient of 0.715 in 24 hr. fasting rats although there was an av. increase in heat production of 17.3% with a corresponding increase in O_2 consumption. Three hrs. after the injection of 0.02 mg. per 100 g. of body wt., there was an av. diminution of 57 mg. of body glycogen, mainly from muscle, which was accompanied by an increase in liver glycogen of 36 mg. The muscle glycogen is probably converted into liver glycogen with lactic acid as an intermediary stage as oral administration of lactic acid resulted in the formation of considerable amts. of liver glycogen. Muscle glycogen, therefore, is an indirect source of blood sugar if the liver is present and if there is escape of lactic acid from the muscles. Thus epinephrine influences the carbohydrate metabolism of the peripheral tissues since it leads to the disappearance of muscle glycogen. **II. The influence of epinephrine and insulin on the carbohydrate metabolism of rats in the postabsorptive state.** *Ibid* 321–41.—"After non-glucosuric doses the most prominent effect of epinephrine is observed in the peripheral tissues and consists in a mobilization of muscle glycogen and in a decreased utilization of blood sugar. Oxidation of muscle glycogen is increased under postabsorptive conditions, sharply distinguishing the action of epinephrine from the effects of pancreatectomy. Part of the lactic acid arising from the breakdown of muscle glycogen escapes removal by oxidation and is carried to the liver where it is deposited as glycogen. In this way a cycle of carbohydrates is established. Blood sugar derived from liver glycogen is utilized in the muscles and lactic acid derived from muscle glycogen is returned to the liver. Epinephrine hyperglucemia develops because the utilization of blood sugar is diminished in relation to the supply of blood sugar by the liver, even if the supply is not much higher than normal. Insulin is the hormone that leads to a preferential utilization of blood sugar and indirectly of liver glycogen. The antagonistic action between insulin and epinephrine is explained by their divergent effect on blood sugar utilization." This extrahepatic action of epinephrine has not been emphasized before. **III. The influence of epinephrine on the utilization of absorbed glucose.** *Ibid* 343–55.—When glucose is fed to 24 hr. fasting rats and 0.02 mg. of epinephrine per 100 g. of body wt. is injected subcutaneously in 0.1 cc. of fluid, hyperglucemia and glucosuria occur after 1 hr. and persist for 4 hrs. and the glucose excretion remains practically const. from hr. to hr. There is a diminished absorption of glucose from the intestine. The injected rats deposit more liver glycogen than the controls after the 1st hr. In the 4 hr. absorption period the rats injected with epinephrine deposit 10 parts less body glycogen and oxidize 5 parts less sugar (per 100 parts of absorbed sugar) than the controls. Of the 15 parts which fail to be utilized in the peripheral tissues 5 parts are stored in excess in the liver, 6 are excreted in the urine and 3 are retained in the body fluids. The glucosuria which develops during the period of increased glycogen deposition in the liver results from a decreased utilization of blood sugar in the peripheral tissues. The extra heat (16.4%) produced during glucose absorption by rats receiving epinephrine is furnished exclusively by fat oxidation. The data so far available do not, however, warrant the conclusion that there exists a direct relationship between epinephrine and fat metabolism.
A. P. Lothrop

The vitamin of fertility—experimental studies on the sexual glands and on the endocrine system during avitaminosis. Vincenzo Bisceglie. *Arch. sci. biol.* (Italy) 11, 194–211(1928).—White rats were divided into 2 groups of ten. The first received the basal diet No. 199 (starch 67, casein 18, pork 8, cod-liver oil 2, vitamin B 1, salts 4%). The second group received the same basal diet to which was added 2 drops per day of wheat oil, or 0.4 g. per day of ground wheat. The expts. continued for 6 months. Pathol. changes were detd. by histological methods (Ciaccio's for the lipoids; Van Gieseon's for connective tissue; Pianese's for granular secretion; Fe hematoxylin for spermato-

genesis; and Wiesel's for the medulla of the suprarenals). *Conclusion.* (1) Basal diet 199 administered to rats produced in the male and female sexual glands degenerative changes resulting in complete sterility. (2) If oil of wheat 2 drops per day was added to diet 199 the degenerative changes were prevented and fertility remained normal. (3) Glands of internal secretion of rats fed with diet 199 showed hyperplasia and hypertrophy but these changes were lacking when oil of wheat was added to the diet. These modifications were probably the result of the changes of the sexual glands than the direct action of the avitaminosis diet. PETER MASUCCI

Antirachitic and growth-promoting action in rats of blood sterols and steryl phosphate. HANS V. EULER, BETH V. EULER AND MARGARETA RYDBOM. *Acta Med. Scand.* **68**, 371–84(1928).—Sterols extd. from dried red blood cells when added to a diet free from vitamin A and D cause great stimulation of growth and prevent the occurrence of rickets if the material had been radiated with ultra-violet rays. It is not effective without radiation. The min. effective dose is 0.05 mg. per day and per rat. Steryl phosphate and phosphite esters were also found very effective in preventing rickets after radiation, causing also a strong, uniform and persistent increase in wt. Pure cholesteryl acetate cannot be activated by ultra-violet rays and contrary results are explained as being due to the presence of the provitamin D as impurity in the prepn. of other authors. S. MORGULIS

Studies on the biochemistry of avitaminosis. VII. Influence of experimental scurvy on hippuric acid synthesis. ALEXANDER PALLADIN AND D. ZUVERKALOV. *Biochem. Z.* **195**, 8–13(1928).—Expts. on the ability of animals sick with scurvy to synthesize hippuric acid show that this becomes reduced in the majority of guinea pigs depending upon the severity of the disease, and a much smaller percent of injected BzOH is excreted as hippuric than normally. In all sick animals the excretion of hippuric acid is diminished even at a time when the animals still consume the usual amt. of food. S. MORGULIS

Changes in metabolism through radiation. III. Changes in carbohydrate metabolism. LUDWIG PINCUSSEN AND DOROTHEE JACOBY. Stadtisches Krankenhaus am Urban, Berlin. *Biochem. Z.* **195**, 449–56(1928).—The blood lactic acid diminishes 20–30% under the influence of radiation. S. MORGULIS

The phosphatide content of organs following feeding of large quantities of phosphatides. BRUNO REWALD. *Biochem. Z.* **198**, 103–11(1928).—About 90% of the phosphatide fed in large amts. and over long periods of time is absorbed through the gastrointestinal canal. Following continued feeding over several months there is definite accumulation of phosphatide in such important organs as the brain, kidney or liver. The blood shows a considerable increase in the phosphatide content of the ether-alc. ext. Also the fat-rich organs and the adipose tissue have a greatly increased phosphatide content. Even large quantities of phosphatide fed to animals have no effect on their health condition. S. MORGULIS

Nitrogen balance and the carbon-nitrogen ratio of the urine in experimental scurvy uncomplicated by hunger. NATALEI YARUSOVA. Inst. for Nutritional Physiology, Moscow. *Biochem. Z.* **198**, 128–37(1928).—During the development of scurvy in animals fed artificially with enough food to prevent the occurrence of complicating starvation effects, the N balance changes from pos. to neg. The utilization of N of the food is not as good as normally, and the small variations in the N excretion do not indicate that there is really an increased destruction of protein. The urinary C increases, so that the C:N ratio, in spite of the almost const. N, also rises. S. M.

Nitrogen metabolism in one-sided nutrition. II. Nitrogen metabolism of chickens during B-avitaminosis. B. A. LAVROV AND S. N. MATZKO. Inst. for Nutritional Physiology, Moscow. *Biochem. Z.* **198**, 138–48(1928).—The complication of B-avitaminosis in chickens by starvation has been prevented. Under such exptl. conditions the wt. of the birds does not change much even when the symptoms of the B-avitaminosis are fully developed. The utilization of the food N remains satisfactory, but there is nevertheless a neg. N balance and an increased uric acid excretion which shows that in the initial stages of the avitaminosis there is already an intense destruction of nitrogenous materials. S. MORGULIS

Fat metabolism following splenectomy. S. LEITES. Inst. of Medicine, Charkow. *Biochem. Z.* **198**, 157–62(1928).—Following splenectomy the hydrolysis of fat, probably in the liver, is disturbed; this is in part at least responsible for the increased alimentary lipemia. The process of hydrolysis of neutral fat is partly transferred to the lungs in splenectomized dogs. The "acetone body" disappearance is slower in splenectomized animals, acetonemia resulting from loading with fat in the diet. This acetonemia is not relieved by the simultaneous administration of glucose. The administration of

glucose increases the hypercholesterinemia observed in expts. with excess fat in the food. These phenomena appear definitely 4–5 hrs. after overfeeding with fat in animals which had been splenectomized one month. S. MORGULIS

Studies on the need and the available amount of fat-soluble vitamins for children in the public schools of Malmö. ERIK M. P. WIDMARK AND BERTEL SVENSSON. Med. Chem. Inst., Lund. *Skand. Arch. Physiol.* **54**, 127–44(1928).—A study of the growth in wt. and length, hemoglobin, incidence of night blindness among control groups of school children (7 to 14 years of age) and those receiving 15 g. cod-liver oil weekly indicates that the children of the public schools in Malmö suffer from no lack of fat-sol. vitamins. The only difference between the 2 groups was the lesser frequency of sickness in the cod-liver group. S. MORGULIS

The effect of mode of loading on the metabolism. P. O. KLINGENDAHL AND NIILO PESONEN. Univ. Helsingfors. *Skand. Arch. Physiol.* **54**, 169–74(1928).—The load causes an increase in metabolism of 90.6–136.6% when carried in both hands or of 179.9–247.6% when carried in one hand as compared to the metabolism with the same load carried on the back. S. MORGULIS

Contribution to the study of the metabolism of carbon in the course of avitaminosis B. T. J. TUBOBINSKI. Dr. Pharm. *Thesis*, Paris **1928**, *Bull. soc. hyg. aliment.* **16**, 270–1(1928).—The C ingested and excreted by pigeons receiving a natural diet composed of grain, on the one hand, and a synthetic diet contg. no vitamin B, on the other, was detd. micro-analytically by Desgrez' method, adapted and modified to permit of the titration of C alkalimetrically. The total amt. of C ingested per bird was approx. the same for both groups (9.06 and 8.90 g. per day, resp.); but those fed a normal diet excreted about 30% in non-gaseous form, and the others only 18–20%. The amt. of C excreted daily was: for the normal birds, 2.5 g. in the feces and 0.22 g. in the urine; for those given the synthetic diet, 1.6 and 0.16 g. daily for the 1st–6th day; 1.18 and 0.23 for the 7th–12th day, 1.32 and 0.40 g., resp., for the 13th–17th day. It would therefore appear that, at least during the early stages of avitaminosis B, there is a more complete assimilation of the ingested food due to a defensive reaction of the organism. The increase in the amt. of urinary C seems to prove that the amt. of incompletely oxidized C increases in exptl. avitaminosis B, and that consequently (as previously observed by Randoin and Simonnet) vitamin B plays a part in the disintegration of C-contg. substances, probably carbohydrates. A. PAPINEAU-COUTURE

The research laboratory and cattle feeding experiment station of the Sociéte scientifique d'hygiène alimentaire. J. ALQUIER. *Bull. soc. hyg. aliment.* **16**, 283–326 (1928); cf. *C. A.* **22**, 803.—A discussion of the economic value and social importance of animal production, with an outline of the general program for the improvement and intensification of animal production in France, a description of the expt. station of the Soc. sci. hyg. aliment. at Rue du Ruisseau, Paris, and an outline of the work carried out at this station in 1925–27. A. PAPINEAU-COUTURE

The rational use of certain saccharine substances in dietetics. (MRS.) L. RANDOIN AND R. LECOQ. *Bull. soc. thérap.* [8] **32**, 293(1927); *Bull. soc. hyg. aliment.* **16**, 246–7 (1928).—R. and Simonnet (*C. A.* **22**, 3673) previously showed that when a considerable proportion of saccharine substances is added to the diet, it is necessary to add a certain amt. of vitamin B to prevent digestive and nervous troubles. Expts. carried out with ordinary commercial sucrose and lactose behaved in practically the same way as the carefully purified products previously used. Addn. of Soxhlet's sugar (dextrin obtained by inversion of potato starch with malt) to the ration of pigeons causes polyneuritis, death taking place on the 25th–35th day; but the addn. of dry malt ext. (contg. chiefly maltose) instead of dextrin to the ration assures normal development, showing that maltose contains vitamin B, but not dextrin. The high nutritive value of dry malt ext. is shown by the fact that when added to substances having no nutritive value (*e. g.*, filter paper or agar-agar) it can sustain life for a long time; but when used alone and in absence of inert substances death takes place in 30–35 days. A. PAPINEAU-COUTURE

Biochemical investigation on starvation. G. MOURIQUAND, A. LEULIER, A. SIMÉON AND A. FINCK. *Paris-médical* **18**, 406(1928); *Bull. soc. hyg. aliment.* **16**, 331 (1928).—As already known, total fast causes a considerable decrease in the glycogenic reserves of the liver, while at the same time the glucemia remains const. and the ketogenesis increases. These facts have been entirely confirmed in starving guinea pigs. The glucose of the blood seems to have lost all ketolytic action, which remains a property of hepatic glycogen as soon as it has reached a certain value. The ingestion of sufficient carbohydrates enables the liver again to muster dynamic glycogen which can prevent acidosis. The results obtained by M. *et al.* also show that guinea pigs which are given nothing but water do not eliminate more NH_3 than normally fed animals, and

that the ratio of N titratable with CH_2O to N titratable with hypobromite decreases though the urine rapidly acquires an acid reaction and the production of ketamic acids increases. It therefore appears that in starvation the organism reacts quite differently from when it is in a state of diabetes when acidosis and hyperammoniuria set in. The decrease in the alk. reserve observed in exptl. scurvy is also found in total inanition, but not in partial inanition when the animals receive a normal proportion of antiscorbutic juice. The loss in alk. reserve therefore takes place by an entirely different mechanism in avitaminosis and in total inanition. Hence, in troubles of nutrition, such as athrepsy of nurslings, which involve an unbalancing of the alk. reserve and a more or less pronounced urinary excretion of ketamic compds., it seems advisable to administer both sugars and alkali, *e. g.*, glucose and $NaHCO_3$. A. Papineau-Couture

The role of calcium in nutrition and biologic processes of the animal organism. A. V. Popova. Inst. for Protection of Maternity and Infancy, Leningrad. *Arkh. Biol. Nauk* **28**, 377–92(1928).—Feeding expts. with guinea pigs upon a normal or scurvy-producing diet demonstrated that the absence or presence of vitamin C has no effect upon the quantity or the Ca balance of the blood. A fat-free diet fed to pregnant rats resulted in litters displaying deficient processes of ossification, pointing to a definite significance of lipoids for the assimilation of Ca. The administration of $CaCl_2$ in the milk, *per os*, or subcutaneously did not affect the Ca balance in normal guinea pigs. Subcutaneous injection brought about local skin reactions and occasionally necrosis. In guinea pigs receiving a diet rich in vitamin C and subsequently inoculated with a virulent culture of tubercle bacilli the development of the infection is delayed and it assumes a somewhat benign type. This is accompanied by a normal or only slightly elevated blood Ca level. Scorbutic guinea pigs in the stage of great loss of Ca show a pronounced tendency to rapid fatal infection with tuberculosis. The great diagnostic value of the blood Ca concn. in tuberculosis and scurvy is emphasized. W. A. P.

Infantile rickets. Treatment by intramuscular injection of a cod-liver oil concentrate. Lawson Wilkins and Benjamin Kramer. Johns Hopkins Univ. *Bull. Johns Hopkins Hosp.* **40**, 52–7(1927).—The intramuscular injection of an ether soln. of a cod-liver oil concentrate in 2 children suffering from active rickets gave very satisfactory results. Fresh calcification of rachitic cartilage occurred within 3 weeks and the changes in the concn. of Ca and P in the blood were identical to that observed previously following administration of cod-liver oil orally. This proves that the effect of cod-liver oil is not on the intestinal mucosa, but it is a general effect exerted through the circulation. G. F. Reddish

Calculation of the normal pelidisi index for the Chinese. Paul H. Stevenson. Peking Union Med. Coll. *Chinese J. Physiol., Report Series 1928*, No. **1**, 1–12.—The racial norm for the pelidisi index for the Chinese approaches 90 as a basic standard except for the newborn in which 93 represents the normal mean. The degree of variation on either side of the racial mean for normal persons is such that any index lying between 80 and 100 may be considered as falling within the range of normal variation. **Calculation of the body surface area of Chinese.** *Ibid* 13–24.—With revised region consts., the use of the linear formula (DuBois) method of calcg. the surface area of the Chinese body was found to agree with the actually measured surface area to within an av. of 1.27%. **Estimation of the surface area of the Chinese.** Susan S. Waddel, Chung-Hsin Han and Yen-Ping Ch'en. Shantung Christian Univ. *Ibid* 25–32.—The surface area of 74 Chinese subjects was estd. by the DuBois linear formula and by the DuBois height-wt. formula. The results show that the error in the application of these formulas to the estn. of surface area of Chinese is little, if any, greater than with American subjects. L. W. Riggs

Basal metabolism in anthropology. Francis G. Benedict. Carnegie Inst. of Washington, Nutrition Lab., Boston. *Chinese J. Physiol., Report Series 1928*, No. **1**, 33–8.—Six investigators were furnished identical app. and accessories for detg. basal metabolism of native subjects in 6 countries, resp., China, Jamaica B.W.I., Peru, Yucatan, New Guinea and S. Australia. Basal metabolism measurements are to have a distinct phase in anthropology as well as in physiology and pathology. The results thus far obtained indicate that a difference in basal metabolism may be due to a racial factor. The slightly lower basal metabolism of Orientals does not indicate a racial deficiency. L. W. Riggs

Basal metabolism of Chinese and Westerners (British). H. G. Earle. Univ. Hong-Kong. *Chinese J. Physiol., Report Series 1928*, No. **1**, 59–79.—The basal metabolic rate of 166 Chinese was detd. in 310 individual expts. According to the DuBois standards, the surface being calcd. with the height-wt. formula of DuBois—the basal metabolic rate of these subjects averaged 8% too low. The rate was also low as com-

pared with the Harris-Benedict and Dreyer standards. The basal metabolism of 31 Chinese in Peking calcd. on the basis of linear measurements of surface was only 2.3% lower than the DuBois standards. That of a group of 10 non-Chinese Orientals in Hong Kong was about 10% below the standards of DuBois, Dreyer and Harris-Benedict standards. That of 5 Orientals in London was 6.5 to 8.5% below all 3 standards, and that of 41 Westerners in Hong-Kong and Peking 7% below the DuBois standards (surface area estd. by the DuBois height-wt. formula). **Addendum to Professor Earle's report. Data and observations of several factors influencing basal metabolism in China.** HEINRICH NECHELES. Peking Union Med. Coll. *Ibid* 80-92.—The effects of season, temp., humidity and growth rates are discussed. The data indicate that the use of the height-wt. formula for normal Chinese may involve an error as much as 10%. In large series this would tend to give too high averages. It is suggested that the DuBois-Stevenson formula be used in future detns. of the body surface of Chinese, in addn. to the original formulas, because the existence of differences in the surface areas of different parts of the body may possibly be of importance. L. W. RIGGS

Diet of coolies in Changsha. MAUDE N. POWELL. Hunan-Yale Coll. Med. *Chinese J. Physiol., Report Series 1928,* No. 1, 129-34.—The diet of 63 coolies in Changsha showed an av. intake per person per day of 67.1 g. of protein, 27.2 fat and 604.9 carbohydrate, total 3008 cal. The av. body wt. was 54.66 kg., which would give 55 cal. per kg. as against 40 cal. per kg. in the West. The larger intake is believed to be due to the low coeff. of digestibility of the rice which constitutes the bulk of the diet. L. W. RIGGS

Study of dietaries in Peking. HSIEN WU AND DAISY YEN WU. Peking Union Med. Coll. *Chinese J. Physiol., Report Series 1928,* No. 1, 135-52.—The diet of the av. middle class Chinese, while adequate in fuel value, is suboptimal in proteins and vitamins A and D, probably adequate in vitamins B and C, and low in Ca and P. There is a prevalence of deficiency diseases. There are probably many cases of mild forms of deficiency which are not recognized. The differences between the diets of Chinese and those of Occidentals are able to account for the difference in physique and energy between them. L. W. RIGGS

Modes or utilization by the organism of the energy liberated by oxidations and the problem of the alimentary value of alcohol. ÉMILE F. TERROINE AND R. BONNET. *Compt. rend.* 187, 359-61(1928).—The oxidations which are carried on in the organism may be divided into 2 categories with respect to the energy which they liberate: in one, of which the oxidation of glucose is a type, the oxidations are entirely utilized for all kinds of work; in the other, of which the oxidation of alc. is a type, the oxidations give only heat. Alc. is uniquely a heat producer. L. W. RIGGS

Content of the kidneys in water, aliphatic acids and cholesterol in normal guinea pigs and in guinea pigs subjected to a scorbutigenic diet. (MME.) L. RANDOIN AND (MLLE.) A. MICHAUX. *Compt. rend. soc. biol.* 99, 584-6(1928); cf. *C. A.* 22, 3913.—The kidneys, unlike the spleen and suprarenals, of the guinea pig do not increase in vol. or wt. when the animal is fed a ration deprived of antiscorbutic vitamin. The content of the kidneys in H_2O, fat and cholesterol remained practically the same in guinea pigs on a diet deprived of the antiscorbutic factor as in animals on a complete or natural ration. L. W. RIGGS

Attempt at physiologic isolation of the vitamin which provokes dyscarbonuria and the urinary elimination of the intermediate products of the metabolism of the sugars. JEAN ROCHE. *Compt. rend. soc. biol.* 99, 589-90(1928); cf. *C. A.* 22, 114.—In a dog fed for 8 months on a diet deficient in vitamins A, B and C, the urinary C/N ratio increased from 0.74 to 1.27, the lactic acid output increased about 20 times and the AcH about 15 times the normal figure. Body wt. fell from 13.6 to 8.9 kg. The addn. of vitamin B alone to the diet was followed by a return of the C/N ratio, lactic acid and aldehyde to the normal figure. Body wt. returned to normal only after the substitution of a N equiv. amt. of grain albumin for casein in the diet. L. W. RIGGS

Activation of ergosterol by ultra-violet irradiation. G. ROUSSEL AND G. GUILHON. *Compt. rend. soc. biol.* 99, 592-4(1928).—Tests upon white rats with irradiated ergosterol prepd. from beer yeast by the method of Windaus, Hess and Rosenheim (cf. *C. A.* 22, 2174, 2770, 3197) confirmed the findings of these authors. The irradiated ergosterol showed antirachitic properties even in doses as small as 0.001 mg. per day. L. W. R.

The comparative nutritive value of the proteins of linseed meal and cottonseed meal for different animals. R. M. BETHKE, G. BOHSTEDT, H. L. SASSAMAN, D. C. KENNARD AND B. H. EDDINGTON. Ohio Agri. Expt. Sta. *J. Agr. Research* 36, 855-71 (1928).—The proteins of linseed and cottonseed meals were equally well digested, pos-

sessed the same biological value and were equally efficient in supplementing the proteins of corn when fed on the same protein basis to young rats. Rats and pigs did not respond alike when fed identical rations contg. linseed and cottonseed meals. The latter proved toxic to pigs. The feeding of linseed and cottonseed meals to growing chicks, either as the chief source of protein or in combination with an animal protein, showed that the proteins of cottonseed meal were more efficient than those of linseed meal. No toxic effects were observed with this species. Evidence is presented which indicates that the age or maturity of the chicken may influence its response to linseed- or cottonseed-meal feeding. Cottonseed and linseed meals were of nearly equal value when fed to beef calves in combination with alfalfa hay, corn silage and corn. It is pointed out that not all species of animals respond alike to linseed- and cottonseed-meal feeding and that the conflicting results obtained with these two feeding stuffs may, wholly or in part, be accounted for on the basis of toxicity or species variation. W. H. Ross

The dietetically and therapeutically important constituents of killed yeast. Max Winckel. *Münch. med. Wochschr.* **74**, 1274–5; *Chem. Zentr.* **1927**, II, 1359.—Citing the literature and his own former work, W. demonstrates that killed yeast has dietetically and therapeutically a higher value than living yeast. The directions given in the 6th edition of the German Pharmacopeia for examg. fermentative medicinal yeast are supposedly based on wrong assumptions. G. Schwoch

Ergosterol, isolated from a Japanese edible mushroom, Cortinellus shiitake. Mizuho Sumi. Inst. Phys. and Chem. Research, Tokyo. *Proc. Imp. Acad. (Japan)* **4**, 116–9(1928).—The com. air-dried sample (15 kg.), extd. with Et_2O and EtOH, gives 35 g. ergosterol, m. 158–9°, α_D^{17} —128°, showing all the reactions of Tanret's ergosterol. Irradiation expts. (ultra-violet rays) are reported. The *C. shiitake* powder was also irradiated; 0.2 g. of this was nearly equiv. to 0.5 mg. of irradiated ergosterol in its antirachitic potency. C. J. West

Vitamins and tumor growth. I. The deficient vitamin B content of chicken sarcoma tissue. Waro Nakahara and Eiichi Somekawa. Inst. Phys. Chem. Research, Tokyo. *Proc. Imp. Acad. (Japan)* **4**, 440–3(1928).—Pigeons fed on polished rice and dried chicken sarcoma manifest symptoms and die of polyneuritis at about the same rate as control pigeons fed on polished rice alone. While the daily intake of only 0.01 g. of dried chicken liver protects rats from the reduction of body wt. on vitamin-B-deficient diet, 10 times that amt. of similarly dried sarcoma tissue fails to give similar protection. Thus, the vitamin B content of the tumor tissue may be very small, if not practically nil. C. J. West

The reaction of the intestinal contents of dogs fed on different diets. W. R. Graham and E. S. Emery. *J. Lab. Clin. Med.* **13**, 1097–107(1928).—Three dogs were fed diets considered normal for these animals. The others were given a preponderance of protein, fat or carbohydrate for 2 weeks, and then killed instantaneously 24 hrs. after eating and the digestive tract was studied immediately. All showed about the same thing. The p_H ranged from 6.2 to 6.5 in the duodenum. Thence it became gradually more alk. as it approached the ileocecal valve to become more acid in the cecum. These results suggest that the reaction of the upper intestine is acid as a result of the HCl and bile and becomes less so as the alk. succus entericus becomes the more dominant factor. There was no evidence that 2 weeks' feedings of different food substances influenced the p_H of the intestinal tract. Ethel W. Wickwire

Hypervitaminosis through large doses of vitamin D. H. Kreitmair and Th. Moll. *Münch. med. Wochschr.* **75**, 637–9(1928).—Vitamin D was administered to animals in the form of irradiated ergosterol in olive or sesame oil. Large doses were administered and usually effected a loss in wt. and eventually death. In white mice 3 mg. daily produced a 37% loss in wt. and death in 15 days. In white rats 10 mg. daily produced a 24% reduction in wt. and death in 10 days. In guinea pigs 50 mg. daily produced a 28% reduction in wt. and death after 36 days. In rabbits 10 mg. daily produced a 20% loss in wt. and death after 10 days. In cats 20 mg. daily produced a 43% loss in wt. and death after 14 days. In dogs 20 mg. per kg. daily produced a 47% loss in wt. and death after 34 days. In hens 50 mg. daily and in axolotl 10 mg. daily produced no effect. Smaller doses produced death after a longer time or merely a loss in wt. The sensitivity of various animals to overdoses of vitamin D varies. Overdoses of vitamin D accelerate the metabolism, particularly that of Ca. R. C. Willson

Ultra-violet irradiation of dehydroergosterol (Windaus, Linsert) 10.

Lecoq, Raoul: **Recherches expérimentales sur les vitamines B contenues dans les levures, dans leurs extraits et dans leurs milieux de culture.** Paris: Vigot. 68 pp. F. 15. Reviewed in *Bull. soc. hyg. aliment.* **16**, 359–61(1928).

SCHMIDT, MARTIN BENNO: **Der Einfluss eisen-armer und eisenreicher Nahrung auf Blut und Körper.** Jena: G. Fischer. 90 pp. M. 6.

F—PHYSIOLOGY

E. K. MARSHALL, JR.

Energy metabolism of women while ascending or descending stairs. FRANCIS G. BENEDICT AND HAZELTENE S. PARMENTER. Carnegie Inst. of Washington and Mount Holyoke College. *Am. J. Physiol.* **84,** 675–98(1928).—A portable app. for detg. O_2 consumption is described. The essential parts are: mouthpiece, valves, soda-lime absorber to remove CO_2, and 3 rubber bags for O_2, two of which contain measured amts. of O_2. For horizontal walking at 34, 65 and 89 meters per min., the total heat production per horizontal kilogram meter was 1.18, 0.79 and 0.87 g. cal., resp. The increment in heat production above that required for standing was: 0.64, 0.52 and 0.67 g. cal. per horizontal kilogram meter. Ascending stairs required about 15 times as much energy expenditure and descending stairs about 5 times as much as did horizontal walking. The mechanical efficiency of the subjects in stair climbing was computed at about 25%. J. F. LYMAN

Further experience concerning the action of menformone on the mammary glands. O. O. FELLNER. *Deut. med. Wochschr.* **54,** 922(1928).—**Reply to above.** E. LAQUEUR. *Ibid* 923. ARTHUR GROLLMAN

Formation of lactic acid in excised organs. HAROLD E. HIMWICH AND SHELTON A. JACOBSON. Yale Univ. *Proc. Soc. Exptl. Biol. Med.* **25,** 53–4(1927).—Paired organs of dogs were studied. The control organ was rapidly triturated in chilled alc., the other was triturated in Ringer or buffered phosphate soln. at p_H 8 and then incubated at 37.5° for 3 to 10 hrs. Extn. and purification were carried out by the Meyerhof method. Lactic acid was detd. by the oxidation method as modified by Friedmann, Cotonio and Shaffer. The kidney, testis, parotid, submaxillary, thyroid and cerebrum were studied. In these tissues, incubation increased the lactic acid from $1^1/_2$ to 30-fold. C. V. B.

Selective distribution of portal blood in the liver. An experimental study. GLOVER H. COPHER AND BRUCE M. DICK. Washington Univ. *Proc. Soc. Exptl. Biol. Med.* **25,** 328(1928).—Trypan blue injected into the veins of the stomach and spleen was almost entirely conveyed by the blood to the left half of the liver. Dye injected into the veins of the upper part of the duodenum, the head of the pancreas and the jejunum was carried to the 2 right lateral lobes. When the veins of the colon were injected the dye was distributed to all parts of the liver but more particularly to the large lobe of the left side. C. V. B.

The uretero-vesical valve and experimental production of hydroureter without obstruction. CHARLES M. GRUBER. Washington Univ. *Proc. Soc. Exptl. Biol. Med.* **25,** 329–31(1928).—Excised bladders and attached ureters of various animals were subjected to increased intravesical pressure; intraureteral pressure did not increase. In dogs the intravesical ureter was excised on one side; the ureter remained patent. Five months later hydroureters were found in the cases where the valve had been removed. C. V. B.

Vasoconstriction in the liver. FRED R. GRIFFITH, JR., J. YORK AND A. ZACHMYS. Univ. of Buffalo. *Proc. Soc. Exptl. Biol. Med.* **25,** 399–401(1928).—In expts. on cats under urethan or chloralose anesthesia, records were taken of the vol. of a hind leg, a kidney, an intestinal loop and the liver during stimulation of the hepatic nerves. The rise of arterial blood pressure which resulted from stimulation of the hepatic nerves was accompanied by, or resulted in, a passive dilatation of the leg, kidney and intestines; the liver alone decreased in vol. Hence the rise in blood pressure appears to be due merely to the forcing of blood from the extensive vascular bed in the liver into the general circulation rather than to the release of a vasoconstrictor substance from the liver into the blood stream. C. V. B.

Relation between absorption and utilization of galactose. CARL F. CORI AND GERTY T. CORI. Univ. of Buffalo. *Proc. Soc. Exptl. Biol. Med.* **25,** 402–6(1928).—For an equal amt. of galactose absorbed, the utilization is highest with lactose, intermediate with a galactose-glucose mixt. and lowest with galactose. This is ascribed to the different rate of absorption of galactose in the 3 cases, the rate being lowest with lactose, intermediate with a galactose-glucose mixt. and highest with galactose. During the absorption of galactose there is no rise in the glucose content of the blood. **The rate of excretion of galactose.** *Ibid* 406–8.—After the establishment of an initial equil., due

to the penetration of galactose into the tissues, the rate of excretion and utilization of galactose remain const. from hr. to hr. The amt. of galactose utilized per unit of time increases with increasing rates of absorption. C. V. B.

Duodenal drainage of the human gall bladder EDW. A. BOYDEN AND A. M. SAUNDDERS. Univ. of Ill. *Proc. Soc. Exptl. Biol. Med.* **25**, 458–62(1928).—When $MgSO_4$ is injected into the duodenum it induces marked contraction of a distended gall bladder and consequent expulsion of bile. Various theories as to the mechanism of action are discussed. **Reflex inhibition of the human gall bladder.** EDWARD A. BOYDEN AND L. PARMACEK. *Ibid* 462–4.—In studying the effect of drinking water on the gall bladder in 10 patients considerable variation was found, ranging from an individual with a discharge of 24 cc. of bladder bile after a glass of water to one who reacted by dilation of the gall bladder. The latter subject was markedly vagotonic and the former was sympaticotonic. It is suggested that the gall bladder is under nervous as well as hormonal control. C. V. B.

Production of placentomata in rats injected with anterior hypophyseal fluid. L. BROUHA. Univ. of Calif. *Proc. Soc. Exptl. Biol. Med.* **25**, 488–9(1928).—In rats injected daily with anterior hypophyseal fluid, and presenting numerous persistent corpora lutea, it is possible to obtain regularly large placentomata if the injury of the uterine mucosa is produced around the 5th day of injections and the animal killed 5 to 7 days after operation. If the injury of the uterine mucosa is made the day before the injections started, it is not possible to obtain large placentomata. A slight enlargement at the sites of injury may be seen. If the injury is made after 10 days or more, placentomata are never obtained. C. V. B.

Production of placentomata in normal and ovariectomized guinea pigs and albino rats. CHARLES K. WEICHERT. Univ. of Wis. *Proc. Soc. Exptl. Biol. Med.* **25**, 490–1(1928).—Corpus luteum hormone was injected into normal rats for 2 days following estrum, at which time the uterine mucosa was stimulated and the injections were continued for 4 days. The rats were killed and placentomata were found. Ovariectomized rats were treated with corpus luteum hormone in the same way and no placentomata were formed. If estrum was produced artificially by injection of the follicular hormone, then the above described treatment produced placentomata. In guinea pigs, which on the 4th day after estrum were ovariectomized and in which the uterine mucosa was stimulated, no placentomata were noted. If the corpus luteum hormone was administered at the time of operation and continued for 4 days, placentomata were formed on stimulation of the uterine mucosa. Guinea pigs were injected daily with corpus luteum hormone from the 6th to 14th day after estrum. Stimulation on the 10th day failed to produce placentomata. C. V. B.

Relation of bone development in infants to calcium and phosphorus retention ratio. AMY L. DANIELS AND MARY K. HUTTON. State Univ. of Iowa. *Proc. Soc. Exptl. Biol. Med.* **25**, 794–7(1928).—Metabolism studies on infants suggested that normal calcification of the skeleton takes place when the Ca and P are retained in the proportion of approx. 2 to 1. Normal bone development appears to take place at different levels of Ca and P retentions. The size of the skeleton may depend on the amt. of Ca and P retained. It is suggested that the disproportion in the Ca and P retentions observed in rachitic infants receiving cow milk modifications are due primarily to a faulty Ca metabolism, the metabolic disturbance being related to a deficiency of vitamin D. C. V. B.

Physiological effects of temporary occlusion of the coronary vessels. DON C. SUTTON AND W. W. KING. Northwestern Univ. *Proc. Soc. Exptl. Biol. Med.* **25**, 842–4(1928).—Compression of the coronary vessels and immediately adjacent tissue as described caused pain without exception, sometimes salivation, vomiting in 1 case, a disturbance of respiration, "acute dilatation" of the heart and various changes in the electrocardiogram. Symptoms were not produced by localized compression and tearing of the myocardium or pericardium. This may be due to a high threshold of problematical pain endings in the normal cardiac muscle and pericardium. Severance of the vagi did not interfere with transmission of pain impulses in 2 dogs. Removal of the left stellate ganglion prevented the transmission of pain impulses in 2 dogs, but salivation occurred in 1 of the 2. A prompt fall of blood pressure occurred in all acute expts. on compression of the coronary vessels as described. Section of the vagi usually prevented this fall in blood pressure. Fall of blood pressure, cardiac dilatation and cardiac irritability are increased by moderate cyanosis (anoxemia). C. V. B.

Auto-digestion. IV. Antitrypsin and clotting time. H. NECHELES AND MAO-KENK CHU. Peking Union Medical College. *Proc. Soc. Exptl. Biol. Med.* **25**, 847–8 (1928); cf. *C. A.* **22**, 2622.—There is no relationship between "antitryptic" power of

the serum and clotting time of the blood. The inconsistency of changes of the "anti-tryptic" titer is confirmed. C. V. B.

Production of sugar by surviving liver. A. CARRUTHERS. Peking Union Med. College. *Proc. Soc. Exptl. Biol. Med.* 25, 850–2(1928).—When the power of the liver to produce sugar is being investigated it is not sufficient simply to est. the sugar in terms of glycogen and sol. sugar. Acid hydrolysis of the whole tissue should also be considered. C. V. B.

Inorganic substances in human blood. I. Cation and anion content of normal serum. W. H. JANSEN AND A. M. LOEW. *Deut. Arch. klin. Med.* **154**, 195–220(1927).—Av., min. and max. values (mg. %) for human blood are, resp.: (cations) Na 320, 315, 350; K 20, 18, 22; Ca 10.2, 9.4, 11.0; Mg 2.34, 1.8, 2.8; (anions) Cl 360, 335, 370; P 13, 10.1, 14.5; S 141.5, 117, 166.6; ratio Na:K 16.5, Ca:Mg 4.0–5.0; K:Ca 2.0. At an av. CO_2 tension of 40 mm. the carbonic acid capacity is 118.6 mg. % CO_2. The chloride: hydrogen carbonate quotient is 2.2. B. C. A.

Comparative study of the physical characters and chemical components of blood and of serous discharges. A. ORSI AND L. VILLA. *Folia clin. chim. micro.* **1**, 190–3 (1926).—The d. of inflammatory discharges approaches that of the plasma. The refraction and viscosity increase with exudates, and, after a discharge, change in a manner depending on the rapidity with which the discharge reforms; in the plasma these characters increase after a discharge and in the case of transudates diminish in both the liquid and the plasma. In general, the elec. cond. varies inversely with the protein concn., systematic variations in relation to certain salts (chlorides) being apparent. The p_H value varies greatly with liquids of either similar or different character, and the alk. reserve in general follows the p_H value. The ratio between the amts. of chloride in the plasma and the corresponding liquid remains const., and the proportions of total non-protein N and of carbamide vary within very narrow limits. Dextrose is always found, being usually in less amt. in the liquids. Cholesterol is present in min. amts. in the transudates, but the exudates contain it in determinable quantity, even when that present in the plasma is normal. Bilirubin is constantly present in the liquids in smaller proportion than in the plasma. B. C. A.

Effect of hemolytic substances on red blood corpuscles and the mechanism of hemolysis. K. C. SEN AND S. K. BASU. *J. Indian Chem. Soc.* **5**, 1–20(1928).—It is suggested that hemolysis is due, in certain circumstances, either to the coagulation or the extreme peptization of the colloidal matter constituting the wall of the cell, in which cases disintegration of the cell occurs by the formation of cracks or by dissolution of the wall. Hemoglobin forms a neg. charged sol in water which is sensitized by acids and peptized by alkalies and bile salts. Saponin causes pptn. in slightly acid, but not in alk. solns. Mixts. such as KOH and $BaCl_2$ or KCl and K oleate have antagonistic actions. Lecithin sol is sensitized by hemoglobin towards $BaCl_2$ (at high concn. a slight peptizing action is observed) and peptized by saponin and bile salts. The latter also peptize cholesterol. The inhibitory action of egg protein and blood serum on the hemolysis of the red blood corpuscles of sheep is due to antagonistic action of the peptizing and sensitizing agents. Na glycocholate is a much more powerful hemolytic agent than Na taurocholate. B. C. A.

The influence of the circulation in the brain upon fatigue. KIYOSHI HORIUCHI. Kaiser Wilhelm-Inst. für Arbeitsphysiologie und das physiol. Lab. der deutschen Hochschule für Liebesübungen, Berlin. *Arbeitsphysiol.* **1**, 75–84(1928).—The purpose was to det. the effect of diminished circulation in the brain upon the onset of fatigue in dogs as measured by the energy output in running upon a treadmill. The respiration expts. were made by means of a small Benedict app. connected to the animal by a mask. The periods were 5 min. with intervals of 5 to 10 min., the dog running continuously. The first series were made upon normal animals, until they were well trained. Then the vertebral arteries were ligated. Later, a second operation was made in which special clamps were placed upon the carotid arteries and left in place until healing was complete. The expt. after the ligating of the vertebral arteries did not show an effect either upon the basal metabolism or upon the onset of fatigue. The partial closure of the carotid arteries produced no change in the basal metabolism except when there was a considerable interference with the blood flow in the brain, and then there was a slight increase. There was a marked increase in O absorption per 100 m. during the work periods at speeds from 64 to 70 m. per min. even from the start of the work. In the following periods, the greatest increase occurred in the expt. in which one carotid artery was entirely closed. T. M. CARPENTER

The effect of voluntarily increased breathing upon the recovery after muscular work. ERNST SIMONSON. Sozialhygienische Untersuchungsamt., Frankfurt a.M.

Arbeitsphysiol. **1,** 88–101(1928); cf. *C. A.* **21,** 2314.—The recovery processes after muscular work are accelerated when there is voluntarily increased breathing in the period following the muscular work. This is ascribed to an increased alveolar O_2 tension, a diminished alveolar CO_2 tension and the favorable mechanical action of the movements in breathing upon the circulation. T. M. CARPENTER

Colloidal chemical changes of the muscle of warm-blooded animals in fatigue. GERHARD SCHMIDT. Univ. Frankfurt a.M. *Arbeitsphysiol.* **1,** 136–53(1928).—The capacity to synthesize hexosephosphate from inorg. phosphoric acid and carbohydrate was materially decreased in the finely divided muscles of rabbits which had been fatigued by strychnine convulsions. The conclusion was also drawn from a series of expts. on rabbits that in sufficiently severe fatigue, physical and chem. changes in the condition of the muscles took place which brought about a weakening of the synthetic capacity of finely divided muscle, and that this is a phenomenon accompanying fatigue, similar to that found in earlier investigations on frog muscle. The decrease in the synthetic capacity could not be ascribed to the high phosphoric acid content of the muscle or to the low glycogen content. T. M. CARPENTER

Studies in the physiology of work. VII. Physiology (energy economy) of shoveling. KURT WENZIG. Kaiser-Wilhelm-Inst. für Arbeitsphysiologie, Berlin. *Arbeitsphysiol.* **1,** 154–86(1928).—The output of energy in shoveling loads to a higher level was detd. by means of a respiration expt. with the Douglas and Haldane method. The loads varied from 0.29 to 13.9 kg., the height to which the loads were thrown ranged from 0.5 to 2.5 m., and the handle lengths were 48 to 84 cm. The rate of shoveling was 8 per min. The heat output per shovel lift at 1 m. height with medium length of shovel varied from 345 cal. with a load of 0.29 kg. to 1224 with a load of 13.90 kg. and the max. energy cost per kg.-m. of external work performed varied from 134 cal. with a load of 2.75 kg. to 49.2 with a load of 13.9 kg. thrown to a height of 1 m. Above and below this height conditions were more favorable for a lower heat output per unit of work.
T. M. CARPENTER

The relation of physiology to other sciences. C. A. LOVATT EVANS. *Nature* **122,** 442–5(1928); *Science* **68,** 259–64, 284–91(1928). E. J. C.

The present position of hormone research. FRITZ LAQUER. *Z. angew. Chem.* **41,** 1028–33(1928). E. J. C.

Phosphorus metabolism. A. YU. KHARIT AND A. I. LIVSHITZ. *Arkh. Biol. Nauk* (Moscow) **27,** 89–99(1927); *Chem. Zentr.* **1927,** II, 2688.—The *P content of dog blood* was studied under various conditions. The *v. portarium* had the most P, and the *r. renalis* the least, because the liver and the kidneys are able to retain P from the blood. The kidneys can eliminate up to 20% of the P administered. Blood serum contains $3.1–7.2 \times 10^{-5}$ g. per cc. of inorg. P, $2.6–3.5 \times 10^{-4}$ g. per cc. of total P. The P detns. were carried out according to Denigès' method (*C. A.* **17,** 1974). The method is simple and gives very reliable results. C. C. DAVIS

The elimination of some widely used barbituric acid compds. in the urine. J. HALBERKANN AND F. REICHE. Allgem. Krankenh., Hamburg-Barmbeck. *Münch. med. Wochschr.* **74,** 1450–2; *Chem. Zentr.* **1927,** II, 1718.—The problem whether *luminal* and *noctal* are eliminated unchanged by the urine was investigated. It was found that luminal is eliminated unchanged, but that after the administration is stopped, its excretion continues for a long time, in 1 case a period of 11 days passing by before the elimination was complete. On the other hand noctal was soon decompd. in the organism, only 2–3% being eliminated unchanged. It was impossible to recover noctal in pure form from the urine so that it could be identified by its phys. properties. Considerable noctal (up to 20%) underwent transformation into the harmless isopropylacetonylbarbituric acid. As a result of the extensive decompn. of noctal in the body, it may be assumed to have no cumulative effect. C. C. DAVIS

Calcium-fixing power of the tissues—muscle, liver, lung. B. RAPINESI. Univ. Naples. *Arch. farmacol. sper.* **45,** 187–92(1928).—In the normal rabbit the Ca content of the muscle, liver and lung is subject to rather wide variations. The Ca-fixing power of these tissues after intravenous injection of Ca gluconate is very striking. This power of fixation by the muscle is inversely proportional to the ordinary Ca content. The Ca thus retained persists until the 9th day; then it is slowly eliminated. It appears that there exists in the tissues a reserve of Ca which is capable of more or less rapid mobilization, and this reserve can be increased by parenteral, and perhaps enteral, administration of Ca. On the other hand, the blood Ca is more or less const. and is not influenced to any noteworthy extent by administration of Ca salts. A. W. DOX

Mineral metabolism in depancreatized dogs. I. The effect of pancreas extirpation upon the composition of the blood and urine. MEYER-BISCH AND DOROTHEE

BOCK. Universitätsklinik Göttingen. *Z. ges. exptl. Med.* **54**, 131–44(1927).—In 27 out of 28 cases the blood Cl diminished and in 11 out of 15 the Na showed a parallel decrease. The alkali reserve was reduced to 6 vol. % in 13 out of 14 cases. In 12 cases the blood K was diminished in only 1 and increased in 5, while the Ca was diminished in 12 out of 16 cases. The output of Cl in the urine was diminished. **II. Effect of pancreas extirpation on the sodium and chlorine content and the swelling of various organs.** *Ibid* 145–51; cf. *C. A.* **21**, 2028.—The Cl in skin and liver was decreased. The Na in muscle and skin did not parallel the Cl. Muscle showed an increased swelling in distd. water, while liver showed a decreased swelling. F. L. D.

The standardization of ovarian hormones. FR. UHLMANN. Ciba, Basel. *Z. ges. exptl. Med.* **55**, 486–504(1927).—A critique of methods of standardization. Bibliography. F. L. DUNN

The chylomicron (free fat) content of the blood in infants. L. C. SCHROEDER AND E. HOLT. *Am. J. Diseases Children* **31**, 201–17(1926); *Physiol. Abstracts* **11**, 218.—Examn. of the blood of infants by dark-ground illumination shows that the chylomicron content varies directly with the fat content of the food, butter giving the most marked increase among the foods studied. H. G.

The hydrogen-ion concentration of the stools of new-born infants. R. C. NORTON AND A. T. SHOHL. *Am. J. Diseases Children* **32**, 183–91(1926); *Physiol. Abstracts* **11**, 478.—Using the colorimetric method, the authors found that the acidity increases gradually from the meconium av. (p_H 6.1) to that characteristic of stools of breast-fed infants (p_H 4.6 to 5.2) in 6 days, the meconium being comparable to fasting feces. H. G.

Respiratory metabolism in infancy and in childhood. S. Z. LEVINE AND J. R. WILSON. *Am. J. Diseases Children* **33**, 204–12(1927); *Physiol. Abstracts* **13**, 103.—Respiration chamber observations showed that healthy children and most sick (afebrile) children eliminate 25% of the total heat produced in vaporization through skin and lungs, and 75% by way of radiation and conduction. H. G.

Researchs on lactation. MARGARET F. LOWENFELD AND SIBYL T. WIDDOWS. London School of Med. for Women. *J. Obstet. Gynaecol. Brit. Empire* **35**, 114–30(1928).—In a daily study of the lactation of a group of women, Ca and ash did not vary with time or method of taking sample. Fat content varied directly with pressure applied to ext. and inversely with the amount of fluid in the breast. GEORGE R. GREENBANK

Interrenin, the hormone of the cortex of the suprarenal gland. M. GOLDZIEHER. U. I. Z. Hosp., Brooklyn, N. Y. *Klin. Wochschr.* **7**, 1124–5(1928).—Macerate fresh beef suprarenals and ext. with 0.2 *N* HCl. Filter. Sat. the filtrate with NaCl and dissolve the active ppt. in 70% alc. Addn. of 5 vols. amyl alc. produces a ppt. which is dissolved in 80% alc. Remove solvent *in vacuo* and redissolve in 80% alc. Reppt. with amyl alc. The white, amorphous powder so obtained is free from protein, is readily sol. in alc. and in dil. acids and insol. in H_2O, dil. alkali, Et_2O or $CHCl_3$. It contains 24% Cl and appears to be a chloride. An analysis, based on the Cl-free product, gives 13.3% N, 43% C, 5.1% H, 37.3% O and 1.3% S. The pharmacol. behavior is discussed. MILTON HANKE

Variations in the concentration of potassium, calcium and choline after stimulation of the sinus caroticus in dogs. D. DANIELOPOLU, MAXIM M. I. DANIEL AND G. G. PROCA. *Klin. Wochschr.* **7**, 1329(1928).—Stimulation of the sinus caroticus leads to a marked increase in the K content of blood and a small increase in the amt. of Ca and choline. MILTON HANKE

Sexual hormone in male urine. S. LOEWE, H. E. VUSS, F. LANGE AND A. WÄHNER. *Klin. Wochschr.* **7**, 1376–7(1928).—Human, male urine may contain testicular hormone as well as the female sexual hormone. It is possible to separate these two (method not described) and it can then be shown that the testicular hormone does not give the Allen-Doisy test. MILTON HANKE

Diagnosis of pregnancy by demonstrating the presence of the hormone of the anterior lobe of the hypophysis in the urine. S. ASCHHEIM AND B. ZONDEK. Charite, Berlin. *Klin. Wochschr.* **7**, 1404–11, 1453–7(1928); cf. *C. A.* **22**, 1182.—An excess of ovarian hormone and of the hormone of the anterior lobe of the hypophysis is produced during pregnancy. These hormones appear in large quantities in the urine. The demonstration of ovarian hormone in small amounts of urine cannot be used for the early diagnosis of pregnancy because conditions other than pregnancy also lead to the excretion of this hormone. The demonstration of hypophyseal hormone in 1.2 to 2.4 cc. of urine is an almost certain proof of pregnancy. Clinical evidence is presented in abundance. For details of the method see *C. A.* **22**, 2597. MILTON HANKE

Purine metabolism of muscle and the mother substance from which ammonia is

produced in muscle. J. K. Parnas. Univ. Lwow, Lemberg. *Klin. Wochschr.* **7,** 1423–4(1928); cf. *C. A.* **21,** 2928.—The predominant purine base of resting muscle is adenine. It probably occurs as adenine nucleotide. Any change in the muscle that leads to the production of NH_3 converts adenine into hypoxanthine; adenine nucleotide is converted into inosinic acid. This change occurs instantly when the muscle is injured mechanically and it occurs slowly when muscle is stored. 95% of the adenine (or hypoxanthine) exists, in the muscle, as nucleotide; only 5% is present as nucleic acid. It is possible that the NH_3 that is liberated during muscular activity may also be derived from adenine by deamination. Milton Hanke

Activation of insulin in non-diabetics. E. Vogt. *Klin. Wochschr.* **7,** 1460–1 (1928).—Normal serum activates insulin. Serum that is obtained just before menstruation has the greatest activating effect. The concn. of ovarian hormone in serum is highest just at this time. Insulin is similarly activated when it is mixed with purified protein-free ovarian hormone. Serum from a castrated woman has very little activating action. Irradiation with ultra-violet light also intensifies the action of insulin. M. H.

Effects of congestion and heat on the composition of venous-blood samples together with some observations on the indirect determination of iron and chlorine in blood corpuscles. Frederick Horace Smirk. Manchester Royal Infirmary. *Biochem. J.* **22,** 739–44(1928).—An incomplete sepn. of plasma from corpuscles gives rise to errors in the estn. of corpuscular blood-chloride and corpuscular blood-iron. Congestion of the arm causes an increased percentage of chloride in the corpuscles and a reduced percentage in the plasma. Heating the arm gives rise to a transference of Cl^- from corpuscles to plasma. Venous samples should be taken with a min. of congestion. Benjamin Harrow

The disappearance of intravenously injected α-, β- and αβ-glucose from the blood. Eric N. Allott. Biochem. Lab., Cambridge. *Biochem. J.* **22,** 772–6(1928).—No difference is shown in the utilization of the α-, β-, and αβ-glucose when these are injected intravenously into rabbits. Benjamin Harrow

Lactic acid formation in muscle extracts. I. The relationship between phosphoric ester accumulation and phosphoric ester breakdown and lactic acid formation from glycogen. David Stiven. Univ. of St. Andrews. *Biochem. J.* **22,** 867–73 (1928).—Using an ext. of cat muscle, S. finds that phosphoric ester accumulation is not an essential accompaniment of lactic acid formation from glycogen. **II. The effect of sodium hexosediphosphate on the rate of ester accumulation during the incubation of glycogen in certain types of extracts.** *Ibid* 874–81.—In a mixt. of zymophosphate and glycogen in certain concns., there is less lactic acid produced than in the corresponding glycogen concn. in the absence of zymophosphate. This is usually associated with an increased accumulation of phosphoric ester in the glycogen-zymophosphate mixt. as compared with the corresponding glycogen expt. **III. Glucolysis in sterile cell-free extracts of muscle.** *Ibid* 882–88.—Glucolysis has been observed in ext. of perfused muscle after filtration through Berkefeld filters. Benjamin Harrow

How muscles contract. Ronald C. Macfie. *Science Progress* **23,** 273–8(1928).—A review of recent work on the biochemistry of muscular contraction. J. S. H.

The plasmalogen content of human serum. K. Imhäuser. *Deut. Arch. klin. Med.* **160,** 109–14(1928); cf. *C. A.* **22,** 2778.—In the serum of healthy adults the plasmalogen content lies between 20 and 40 mg. %. No difference (between the sexes) was observed in the plasmalogen content of the blood. Following a meal rich in plasmalogen (300 g. meat) the content of the blood rose sharply and sometimes exceeded 50 mg. %, but in a few hours the concn. fell to normal. A diet poor in plasmalogen (flour, rice, apples and a fat free dried milk) caused a fall in the concn. in the blood; but the min. (reached after 2 weeks' dieting) was not appreciably lower than the values sometimes found on a normal diet. No free plasmalogen was observed since this substance is extremely labile. P. Y. Jackson

Pancreatic function. I. The quantitative estimation of pancreatic secretion. Seizaburo Okada, Eiichi Sakurai, Taumoto Imazu and Kwanichi Kuramochi. Medical Clinic, Imperial Univ. Tokyo. *Arch. Internal Med.* **42,** 270–81(1928).—Fractional tests of duodenal activity were made every half hr. for 3 hrs. to eliminate variations. Of the stimulants used alc. and ether caused only an initial increase in output; HCl seemed to increase it slightly. Modifications of the Gross casein test for trypsin, Okada's colorimetric method for amylase and Rona-Michaelis lipase test were employed. The normal values in kg.-units were: 30–120, av. 70 for trypsin, 50–300, av. 140 for amylase and lipase. The highest values were 500 and 600, resp. The enzymic activity is highest between 20 and 40 years. The amt. of duodenal returns is independent of the age between 16 and 42 years. Both activity and amt. are

considerably higher in men than in women of all ages. The quantity of *bile pigment* was 2.5–61.7 mg./3 hrs., and not above 5 mg. in 86% cases; av. 9 mg. for women, 17.2 for men. Also in *Proc. Imp. Acad.* (*Japan*) 4, 131–3(1928). MARY JACOBSEN

Gastrointestinal reaction to the emotions. The role of the vegetative system C. W. LUEDERS. *Arch. Internal Med.* 42, 282–96(1928). MARY JACOBSEN

A study of lactocones. GIAN C. BENTIVOGLIO. *Pediatria Rivista* 36, 563–94 (1928).—Under the ultramicroscope human milk shows on a black background numerous luminescent granules of fairly uniform size which have a lively Brownian movement and can be easily distinguished from the fat globules, which appear as disks with luminous edge and dark center. Their no. is independent of the age of the woman, stage of lactation, fat, protein, lactose or ash content of the milk, but a high fat content runs parallel with a high content in lactocones (so called in analogy to hemocones). A high lactocone no. is rather unfavorable for the digestion of the infant. Cow milk shows few lactocones of varying size on a gray background, which consists of luminous particles just at the limit of visibility. Expts. with protein coagulants and fat solvents ($CHCl_3$ and AmOH) show that lactocones are highly dispersed *fat* micelles, 1–0.5μ, while the small particles of cow milk are *casein micelles* which do not pass a Chamberland filter. In cow milk casein probably plays the role of protective colloid for the fat; in human milk sol. albumin protects the casein. If the sol. albumin content of cow milk is brought up to that of human by the addn. of 2% albumin the gray background is replaced by a clear black one. Coagulation of casein in human milk by 3–4 min. heating produces a gray background, reduces the no. of lactocones and makes the milk appear opaque after centrifuging. The dietary consequences of these findings are discussed. M. J.

Albinism. FRANCESCO GRAZIANO. *Pediatria Rivista* 36, 948–60(1928).—In 2 albino children the adrenaline, atropine and pilocarpine tests revealed sympathetic hypertonus. The blood pressure was low. Albinism is attributed to hyperactivity of the *adrenal cortex.* MARY JACOBSEN

The role of the reticulo-endothelial system in the healing of fractures. GIAN CARLO PERACCHIA. *Rev. sud-americana endocrinol. inmunol. quimioterap.* 11, 519–53 (1928) (In Italian). MARY JACOBSEN

The instability of red cells in splenectomized animals. ELEOGARDO B. TROILO. *Rev. sud-americana endocrinol. inmunol. quimioterap.* 11, 554–6(1928).—Three guinea pigs presented 7 months after splenectomy a practically normal no. of red cells, with a slight decrease of hemoglobin and a considerable leucocytosis. This confirms Vitali's view of the inhibitory action of the spleen on leucocytogenesis. The chlorosis demonstrates the role of the spleen in Fe metabolism. The most significant effect of splenectomy is the irregular variation of the blood picture, which shows the regulatory importance of the spleen. MARY JACOBSEN

The precipitation of cholesterol in the intestine. HUGO SALOMON. *Arch. Verdauungskrankh.* 42, 204–5(1928).—Cellulose-rich foods greatly increase the pptn. of cholesterol in the intestine. FRANCES KRASNOW

Influence of hydrochloric acid on the emptying of the stomach. JEROME MARKS. Univ. Berlin. *Arch. Verdauungskrankh.* 42, 567–72(1928).—Acid delays the emptying by $^3/_4$ hr. The greater the amt. of acid, the greater the delay. FRANCES KRASNOW

Secretion of the fasting stomach—a spontaneous function. J. SCHREIBER. *Arch. Verdauungskrankh.* 43, 374–7(1928). FRANCES KRASNOW

Relationship between the color and the fat content of bovine corpora lutea. WM. L. BLEECKER. Univ. of Arkansas. *J. Am. Vet. Med. Assocn.* 73, 577–602(1928).—Degree of pigmentation does not run parallel with the amt. of fat contained in the tissue as detd. by sectioning and staining with Sudan III or as detd. by extn. using the Soxhlet method. There is no relationship between pregnancy, the stage of gestation, or the breed of the animal and pigmentation or fat content of corpora lutea. F. K.

Brief note on lactosuria in nursing women. ALDO CASTELLANI. Ross Inst. and Hosp., London. *J. Trop. Med.* 31, 213–4(1928).—Urine treated with *B. paratyphosus* exhausts all reducing sugars except lactose. Further fermentation by *B. coli* indicates the presence of lactose. All of 12 cases studied showed lactose by this method. F. K.

Formation of crystals within the red blood corpuscles. H. W. KRANZ. Universitäts-Augenklinik Giesser. *Z. Biol.* 87, 258–68(1928).—A method is described for fixing red blood cells. When thus prepd. and viewed through a polarizing microscope, they seem to show the presence of crystals. FRANCES KRASNOW

Refractometry of body fluids. III. Index of refraction of blood serum of healthy and pregnant women and their babies. SEIGO FUNAOKA AND MORIKUNI SAITO. *Acta Schol. Med. Univ. Imp. Kioto* 9, 307–25(1928). W. D. LANGLEY

The physiological effects of radiation. HENRY LAURENS. Tulane Univ. *Physiol.*

Rev. **8**, 1–91(1928); cf. *C. A.* **22**, 2956.—General review with extensive bibliography emphasizing metabolic changes. E. R. LONG

Industrial fatigue in relation to atmospheric conditions. H. M. VERNON. *Physiol. Rev.* **8**, 130–50(1928).—General review. E. R. LONG

Calcium metabolism. CORBET P. STEWART AND GEORGE H. PERCIVAL. Univ. Edinburgh. *Physiol. Rev.* **8**, 283–312(1928); cf. *C. A.* **22**, 3204.—General review with extensive bibliography. E. R. LONG

The growth and function of the corpus luteum. S. A. ASDELL. Univ. of Rochester. *Physiol. Rev.* **8**, 313–45(1928).—General review including chemistry of substances contained in corpora lutea. E. R. LONG

The digestive work of the stomach. B. P. BABKIN. Dalhousie Univ. *Physiol. Rev.* **8**, 365–92(1928).—General review with bibliography. E. R. LONG

Blood cell metabolism. II. The effect of methylene blue and other dyes upon the glucolysis and lactic acid formation of mammalian and avian erythrocytes. E. S. GUZMAN BARRON AND GEORGE A. HARROP, JR. Johns Hopkins Hosp. and Univ. *J. Biol. Chem.* **79**, 65–87(1928); cf. *C. A.* **22**, 3691.—The relationship between glucolysis and the oxidative processes in blood cells may be expressed by the ratio, *mM* of lactic acid increase/2 × *mM* glucose decrease, which is termed the *glucolytic quotient.* Normal adult mammalian red blood cells with almost no oxidative processes show a high glucolytic quotient. Nucleated erythrocytes (avian blood cells) with appreciable oxidative processes have a low quotient. The addn. of methylene blue (or dyes with similar oxidation-reduction potentials) to the blood undergoing glucolysis produces an increased sugar degradation and a diminished formation of lactic acid. This is probably due in part to the oxidation of some intermediary product. The *glucolytic quotient* is lowered. The process begins only after the glucose mol. is acted upon by the glucolytic enzyme and is converted into other unstable and oxidizable substances. It is suggested that oxidation may take place in the early stages of dissocn., before the glucose mol. is split into 3 C chain fragments, probably when the glucose mol. is esterified to hexosediphosphoric acid. This reaction requires the presence of O_2 but the addn. of cyanides does not impair the oxidative process. It is suggested that methylene blue acts as a catalyst, rendering the hexosephosphate mol. more sensitive to oxidation by mol. O_2. A. P. LOTHROP

Composition of bone. III. Physicochemical mechanism. M. J. SHEAR AND BENJAMIN KRAMER. Jewish Hosp., Brooklyn, N. Y. *J. Biol. Chem.* **79**, 125–45 (1928).—As a criterion for the formation of ppts. of Ca phosphates, the ion product $(Ca^{++})^3 \times (PO_4^{\equiv})^2$ is inadequate. No evidence has been found which satisfactorily demonstrates the presence in bones of a compd. with the formula, $Ca_3(PO_4)_2$. From data in the literature $p_{K'_{s.p.}}CaHPO_4$ is calcd. to be 6.4 ± 0.1 at 38°. At any ionic strength up to that of serum $p_{K'_{s.p.}}CaHPO_4 = 6.4 - 2.3\sqrt{\mu}$. The ion product $(Ca^{++}) \times (HPO_4^{=})$ at which calcification begins, both *in vivo* and *in vitro*, is numerically equal to the value calcd. for $p_{K'_{s.p.}}CaHPO_4$ at the ionic strength of serum. A theoretical basis is suggested for the empirical Ca × P product. In inorg. serum solns. with a p_H of 7.35, Ca × P = 1.5 × 10^7 ($[Ca^{++}] \times [HPO_4^{=}]$). Inorg. serum solns. with empirical Ca × P products less than 30 appear to be unsatd. with respect to $CaHPO_4$; calcification is not obtained with these solns. The evidence indicates that rachitic serum is definitely undersatd. with respect to $CaHPO_4$ and that normal serum is slightly undersatd. with respect to this salt. **IV. Primary calcification.** *Ibid* 147–60.—"When analyzed with the micro-technic, unashed normal rat bone gave a value of 1.99 ± 0.01 for the ratio, residual Ca:P; this is in agreement with the results of analyses of large amts. of bone by macro-methods. The proportion of carbonate in normal rat bone increases with age. The ratio, carbonate Ca:total Ca, is about 8–10% in the bones of young rats and 15–16% in those of adult rats. The proportion of carbonate Ca in rachitic rat bone is greater than that in normal rat bone of the same age. The proportion of carbonate in primary calcification is less than in the older bones of the same animals. The ratio, residual Ca:P, in primary calcification has a high value of 2.23 ± 0.03. This high ratio is interpreted as indicating the presence of a basic Ca salt in freshly deposited bone salts. The compn. of the primary calcification appears to be independent of the antirachitic reagent; high Ca:P ratios were obtained regardless of whether fresh calcification was induced by cod-liver oil concentrate, butter, irradiated cholesterol or irradiated yeast. A. P. LOTHROP

The electrical transference of calcium in blood serum protein solutions. DAVID M. GREENBERG. Univ. of Cal. Med. School. *J. Biol. Chem.* **79**, 177–82(1928).—The existence of complex Ca-protein ions has been demonstrated by the elec. transference method in blood serum to which mixts. of NaOH and $Ca(OH)_2$ were added. These

results confirm those of Loeb and Nichols (*C. A.* 21, 3946) and Marrack and Thacker (*C. A.* 20, 3182) and are not in accord with the proposal of Cameron and Moorhouse (*C. A.* 19, 2078) "that the non-diffusible Ca is bound to some org. substance which may be the parathyroid hormone." A. P. LOTHROP

Studies of gas and electrolyte equilibria in blood. XII. The value of p_K' in the Henderson-Hasselbalch equation for blood serum. A. BAIRD HASTINGS, JULIUS SENDROY, JR. AND DONALD D. VAN SLYKE. Rockefeller Inst. *J. Biol. Chem.* 79, 183–92(1928); cf. *C. A.* 22, 3917.—"The variations, due to causes which cannot be ascertained at present, are such that one does not appear justified in expressing the value of p_K' to more than 2 decimal places. Consideration of the available data indicates that, when the soly. coeff. of CO_2 in serum is taken as 0.510, and the p_H of 0.1 *N* HCl is taken as 1.08 in standardizing the electrometric p_H detns., the value of for serum at 38° is approx. 6.10. The p_K' values calcd. from the same data with Bohr α, 0.541, used by most previous authors, would be 6.13." **XIII. The dis bution of chloride and bicarbonate in the blood of normal and pathological human subjects.** A. BAIRD HASTINGS, JULIUS SENDROY, JR., JOHN F. MCINTOSH AND DONALD D. VAN SLYKE. *Ibid* 193–209.—"The distribution of Cl and HCO_3 between cells and serum has been studied in human venous blood. The distribution ratios (cell Cl): (serum Cl) and (cell $BHCO_3$):(serum $BHCO_3$) have been found to average several percents higher than in horse blood at the same p_H values. The difference approximates that calcd. by Van Slyke, Wu and McLean's equation 10 from the lesser base-binding power of the colloid constituents of human cells, indicated by the analysis of Adair (*C. A.* 19, 2211). Studies of blood from patients with nephritis (severe but not uremic), cardiac disease, pneumonia and acute arthritis, representing a fairly wide range of pathol. conditions, failed to reveal evidence that in any of these conditions the mechanism controlling the electrolyte distribution becomes qual. altered, or that very marked quant. deviations from the normal distribution ratios occur, other than the predicted r changes due to blood p_H variation. The only definite quant. deviation from the normal was a tendency for r_{HCO_3} values to be somewhat higher in part of the nephritic bloods. The failure of the r_{Cl} and r_{HCO_3} ratios to deviate in the pathol. bloods more markedly from the ratios observed at the same p_H values in normal blood appears attributable to the fact that the 2 factors which are theoretically most important in detg. the values of the ratios at any given p_H are the total base concn. in the serum and the hemoglobin concn. in the cells, and that neither of these is liable to great fluctuations in the conditions studied." A. P. LOTHROP

The hemolytic action of inorganic acids. MEYER BODANSKY. Univ. of Texas Med. School. *J. Biol. Chem.* 79, 229–39(1928).—"The order of effectiveness of the inorg. acids in producing hemolysis is: $H_3PO_4 > H_2SO_4 > HCl > HNO_3$. In the concns. necessary to produce rapid hemolysis (p_H 1.0 to 2.8), injury to the cell membrane, rather than an osmotic effect, is the main factor responsible for the disintegration of the corpuscle by inorg. acids. Human corpuscles have a somewhat lower resistance to inorg. acids than dog corpuscles. The anemic and normal erythrocytes do not differ appreciably in their resistance. In hemolysis by acids, the reaction between the cell constituents and the acid is complete before hemolysis occurs. Inorg. acids react readily with the constituents of the intact corpuscle. This is partly due to rapid diffusion, even from very dil. solns. of inorg. acids through the red blood cell membrane." **Lipoid solubility, permeability and hemolytic action of the saturated fatty acids.** *Ibid* 241–55.—Osmotic effects are involved in the hemolysis produced by fatty acids as increasing the osmotic concn. of the outside fluid retards the hemolysis. The fatty acids are effective in the following order: acetic < propionic < butyric = isobutyric < isovaleric < valeric < isocaproic < caproic < heptylic < caprylic < pelargonic < capric. Formic acid resembles the inorg. acids in its hemolytic action. The greater content of buffer substances in washed human corpuscles makes them more resistant than dog corpuscles to hemolysis by neutralizing a greater amt. of acid. Detns. of the relative concn. gradients of the acids penetrating the corpuscle and producing hemolysis show that the relations which exist closely resemble those that have been observed by other workers in a variety of phenomena in plant and animal tissues involving the primary penetration of the acids. That a close parallelism exists between lipoid soly. and the hemolytic effectiveness of the fatty acids is shown by the results of detns. of the distribution of the acids between H_2O and olive oil. A. P. LOTHROP

Factors influencing the excretion of calcium. BENOT HAMILTON AND MARGARET MORIARTY. Harvard Med. School. *Am. J. Diseases Children* 36, 450–62(1928).—The amt. of Ca excreted by infants fed upon breast milk is proportional only to the total amt. of the fixed bases, Ca, Mg, Na and K, in the milk. The increase in the p_H

of the intestinal contents, resulting from the buffering action of the fixed bases in the milk, may favor the formation of $Ca_3(PO_4)_2$ and Ca soaps, the principal forms in which Ca is excreted. The proportion of Ca excreted is increased by the addn. of small quantities of alkali to the milk given, and decreased by the addn. of small quantities of acid.

E. R. MAIN

The effect of hydrogen-ion concentration on the respiratory exchange of tissues. M. COMEL. *Arch. sci. biol.* (Italy) **11**, 145–73(1928).—Part of the data is similar to that given previously (cf. *C. A.* **21**, 2300). A complete bibliography and a detailed description of methods heretofore used are included. Additional data are given showing that in winter frogs, hibernating or non-hibernating, the consumption of O_2 and production of CO_2 are greatly reduced in contrast to spring frogs; the respiratory exchange of the latter is more than double that of winter hibernating frogs and about $1^1/_2$ times that of winter non-hibernating frogs. In spring frogs there is a rapid diminution of O_2 consumed and a similar but not proportional reduction in CO_2 produced at p_H below 5.31. At p_H 2.97 the O_2 consumed is extremely small and there is a further reduction in CO_2 produced.

PETER MASUCCI

Avitaminosis. I. Is hyperglucemia a constant phenomenon in avitaminosis? A. PUGLIESE. *Arch. sci. biol.* (Italy) **11**, 182–93(1928).—The av. normal blood sugar of 12 pigeons was 0.209%. In starved pigeons there was a small but const. reduction in blood sugar, which reached a low level and then remained const. during the inanition. Some pigeons were fed polished rice; some received grain autoclaved at 133° for 2 hrs.; a few received autoclaved grain irradiated for $^1/_2$ hr. with ultra-violet rays. Data are given showing duration of expt., loss in wt., oral temp., blood sugar and hepatic and muscle glycogen. Hyperglucemia in avitaminosis from polished rice or autoclaved grain was not a const. phenomenon. As in fasting, avitaminosis from polished rice or autoclaved grain resulted in a strong diminution of hepatic and muscle glycogen. The glycogen disappeared completely when the loss in body wt. exceeded 40%. P. M.

The limit of tolerance, glucemia and refractometric value of blood serum after sea bathing. PAOLO ROWINSKI. *Arch. sci. biol.* (Italy) **11**, 224–50(1928).—(1) Under the influence of sea baths the concn. of the protein substances in the serum increased. From 20 detns. the av. % of protein before the baths was 8.05, after the baths 8.49. These figures were calcd. from the refractive index of the serum before and after bathing. (2) The amt. of blood sugar decreased. The av. of 18 detns. was 0.116% before, and 0.102% after, bathing. (3) The limit of tolerance for glucose was raised as the hyperglucemia and glucosuria diminished. The increase in concn. of serum proteins is attributed to the elimination of water (av. loss of 20 detns. 5.49%) and dissolved salts. The increase in the "limit of tolerance" for glucose and the diminution of blood sugar under the influence of bathing are related. Theories are advanced explaining both phenomena. P. M.

Studies on the blood of fatigued animals. II. Physicochemical constants. Variations in blood content, residual nitrogen and glucose. O. M. BERNARDI. *Boll. soc. ital. biol. sper.* **3**, 123–6(1928); cf. *C. A.* **22**, 3440.—A table of physicochem. consts. of blood serum following fatigue is given; it includes the delta (Δ), elec. cond. and viscosity. Another table includes residual N and glucose based on wet and dried wt. There is a decrease in the % of H_2O; an increase in delta; a diminution of elec. cond.; an increase in viscosity and an increase in residual N. There was a decrease in glucose.

PETER MASUCCI

The metabolism of the retina at different stages of its development. CHICHIO TAMIYA. *Biochem. Z.* **189**, 114–8(1927).—Up to the 17th day of incubation of the chick the value of $Q_M^{N_2}$ is < 50, which means that the lactic acid production is < 0.2 mg. per hr. per mg. retina. The quotient then becomes doubled about the time of hatching and gradually increases to 130–163 by the end of a year. The lactic acid production again diminishes with greater age. S. MORGULIS

Can lactic acid disappear anaerobically from the muscles? F. LIPMANN. *Biochem. Z.* **191**, 442–9(1927).—Lactic acid does not disappear from cut muscles under anaerobic conditions even in the presence of NaF. S. MORGULIS

Studies on the glucolysis problem. I. Glucolysis in the blood of normal, non-diabetic dogs. BÉLA ROHNY. *Biochem. Z.* **192**, 1–7(1928).—Glucolysis in normal oxalated blood proceeds more quickly at 37° than at lower temps. and ceases at 56°. Glucolysis proceeds also in blood serum but it becomes much reduced in the first hrs. or is even overcompensated by the ensuing increase in glucose concn. This increase in glucose concn. is thought to be peculiar to the blood. Furthermore, inasmuch as the sugar increase is more pronounced in sepd. serum than in serum in contact with the red cell mass it is concluded that the latter contains substances which inhibit the sugar in-

crease. **II. Glucolysis in the blood of experimentally diabetic (depancreatized) dogs.** ZOLTÁN ASZÓDI. *Ibid* 8–13.—Blood and serum from depancreatized dogs behave similarly in the matter of the diminution or rise in the sugar concn. S. M.

Effect of attenuation of air on the hemoglobin concentration in the blood cells and the influence of the spleen on blood regeneration. L. DRASTICH. *Biochem. Z.* **195,** 189–205(1928); cf. *C. A.* **22,** 108–9, 3207.—An app. is described for maintaining low atm. pressures (down to 300 mm. Hg) over long periods of time. The hemoglobin concn. of the erythrocytes of animals kept for some time in rarefied air is somewhat below normal but increases later, which indicates a further formation of hemoglobin in the cells which were previously prematurely discharged into the blood stream. The concn. is detd. from the values of the absolute hemoglobin content of the blood and the cell vol., thus: $K = Hb \times 100/Ev$, where K = concn., Hb = g. hemoglobin per 100 cc., and Ev blood cell vol. in %. In splenectomized animals the regeneration of the blood in rarefied air proceeds slower than in non-operated animals. The erythrocytes also become larger in the splenectomized animals just as in the case of pernicious anemia. Injections of spleen pulp have a favorable influence on the blood-cell production. S. M.

Avitaminosis and adrenals. II. Behavior of pigeons suffering from B-avitaminosis towards adrenaline and choline. ERNST SCHMITZ AND H. J. POLLACK. Physiol. Inst., Breslau. *Biochem. Z.* **195,** 428–41(1928); cf. *C. A.* **21,** 2296.—Feeding of whole suprarenal bodies to pigeons fed on rice prevents the onset of suprarenal hypertrophy which is not brought about by administering adrenaline. The effect of the whole suprarenal gland cannot be attributed either to choline or to the adrenaline. S. MORGULIS

Studies on the metabolism of the placenta. I. EISUKE ISHIKAWA. Inst. für exptl. Pathol., Univ. Wien. *Biochem. Z.* **195,** 469–74(1928).—The incubation under strictly sterile conditions either of rabbit placenta or of its ext. under aerobic or anaerobic conditions results in an increase of reducing substances (glycogenolysis). The addn. of glucose has no effect on this process, but levulose or dihydroxyacetone does accelerate and increase the glycogenolysis. The placenta pulp or ext. under sterile conditions does not affect the levulose or dihydroxyacetone. Under aerobic conditions there is generally an initial diminution of lactic acid, but in other cases there is no alteration. In later phases of the process there is an increase in lactic acid. Under anaerobic conditions, however, there is never an initial loss. The addn. of dextrose or levulose has no noticeable influence on the amt. or rate of lactic acid formation. S. MORGULIS

Potassium in the blood of normal individuals. Experiments on the Kramer-Tisdall method for potassium determination. HELGI TOMASSON. Staatsirrenanstalt Vordinborg, Dänemark. *Biochem. Z.* **195,** 475–85(1928).—The Kramer-Tisdall method for K gives unreliable results in the presence of appreciable quantities of NH_3. Serum, must, therefore, be worked up immediately while still fresh. Added KCl is not satisfactorily recovered from serum, the results being generally too low. In 13 normal persons 20.3 mg. K per 100 cc. serum was found (17–23 mg. extreme variations). The range of variation for the same individual is of the same magnitude. Sudden muscular work does not affect the serum K. In women a rise in the K concn. is found in the early stage of menstruation. S. MORGULIS

The influence of thyroid substances on the fat metabolism. I. ABELIN AND P. KÜRSTEINER. Physiol. Inst., Bern. *Biochem. Z.* **198,** 19–46(1928).—The large loss of fat after the administration of thyroid substance is chiefly due to a sp. effect on fat metabolism. In animal expts. it was shown that already 24–72 hrs. after feeding thyroid there was considerable loss of fat although the oxidation was only slightly increased. The greatest loss occurs in the striated muscles, then in the liver and lungs. The metabolism of fat is affected in the same manner as that of carbohydrate or protein, and manifests itself chiefly in an inability of the cells to resynthesize these substances from the foodstuffs. The intensity of the thyroid action increases as the fat is diminished. On the contrary, early administration of abundant fat inhibits the utilization of the hormone, the liver retaining its glycogen-forming ability, the basal metabolism not being so greatly increased and the organs not losing so much of their fat depots. The influence of the fat is favorable only in the initial stages of hyperthyroidization but in later stages it actually exerts an injurious effect. However, the antagonism between the 2 substances is obvious at all times, and the excess of either fat or thyroid diminishes the physiological action of the other. After the administration of thyroid substance the liver becomes both fat and glycogen poor, but under the influence of adrenaline the glycogen-forming ability of the liver is partly restored. Fat is not only a source of energy and vitamins but also a substance with important antitoxic properties and a regulator of thyroid function. S. MORGULIS

The spleen as regulator of the amino acid balance of the blood. I. Effect of

spleen extirpation on the amino acid content of blood, red blood cells and plasma. LIDIA TUTKEVICH. Ukrnauka, Charkow. *Biochem. Z.* **198,** 47–59(1928).—Intravenous injection of amino acids causes at first (10 min.) a lowering of the amino acid content of the red blood cells. Splenectomy, on the contrary, results in a failure of this preliminary reaction of the cells and the injection of amino acids then causes invariably a rise in the amino acid content of both cells and plasma. The spleen is responsible for the ability of the spleen to adsorb amino acids which can be easily demonstrated *in vitro*. Following splenectomy, the *in vitro* adsorption capacity of the cells from dogs and rabbits completely disappears or is diminished. The red cells, when they adsorb a certain amt. of amino acid, lose a corresponding quantity of non-protein N to the plasma. The spleen plays an important function in the retention or accumulation of amino acids either of endogenous or exogenous origin. **II. Effect of denervation of the spleen on the amino acid content of the blood, red blood cells and plasma.** *Ibid* 60–4.—The relative vol. of red cells and plasma diminishes in animals with denervated spleens as well as in splenectomized animals. Following denervation of spleen the blood amino acid content decreases at first but increases subsequently whereas in splenectomized animals the amino acid content remains low. The difference is entirely due to the cellular elements since the amino acid content of the plasma remains unchanged. Injection of amino acids causes in animals with denervated spleens an increase in the amino acid content of the red cells, because the spleen is physiologically isolated and does not take up any of the substance. S. MORGULIS

Metabolism of walking on a plane surface. A. HIETANEN, M. NIKKINEN, H. NYYSSÖLÄ AND G. STERNBERG. Univ. Helsingfors. *Skand. Arch. Physiol.* **54,** 145–8 (1928).—Oiling the tread-mill caused an increase in metabolism which in 2 exptl. subjects ranged from 51.1 to 72.8%. S. MORGULIS

The metabolism of liver tissue from rats of different ages. J. A. HAWKINS. Rockefeller Inst. *J. Gen. Physiol.* **11,** 645–7(1928).—These expts. were undertaken to det. whether there is a difference in respiration and aerobic glucolysis in livers of rats of different ages. The results show that no difference occurs in livers of rats 22 months, 1 yr. or 3–21 days old. Practically no glucolysis takes place in the livers of old and normal adult rats, but a certain amt. in those of very young rats. Livers of young rats therefore have the same type of metabolism as embryonic tissue. The glucolytic activity of a tissue seems to be a function of the growth rate. Cf. Murphy and Hawkins, *C. A.* 20, 445; Hawkins, *C. A.* 20, 3506. C. H. RICHARDSON

Significance of the chemical composition of the secreting and dry mammary gland to milk secretion. J. W. GOWEN AND E. R. TOBEY. Rockefeller Inst. and Maine Agr. Expt. Station. *J. Gen. Physiol.* **12,** 123–8(1928).—Cows producing up to 30 lbs. milk at each milking have the lactose equiv. of this milk in the udder when milking commences. The av. excess lactose present in the udder after deducting the amt. to be contained in the milk is 2.1 lbs. which is equiv. to the milk retained in the udder when the cow is dry. No sugar is found in the udder in the quiescent state. The udder contains a large excess of fat, ash and N in proportion to that necessary for milk formation. The excess of udder lactose over milk lactose is much less. Lactose is formed from some blood constituent, probably glucose, as needed for milk formation. The dry udder builds up a fat reserve having a Reichert-Meissel no. quite different from that of butter fat. It contains no sugar and less ash but its N content is like that of the secreting gland. C. H. RICHARDSON

Basal secretion of the stomach. I. Influence of residues in the small and large intestine. CHIH-TEH LOO, HSI-CHUN CHANG AND R. K. S. LIM. Peking Union Med. Coll. *Chinese J. Physiol.* **2,** 259–78(1928).—Pavlov- and Heidenhain-pouch dogs were given glass and silver beads with their meals. The glass beads were all expelled within 2 days and the silver beads within 3 days. When different-colored glass or different-shaped silver beads were given on successive days, some mixing of the daily quota of beads usually occurred and this was found by x-ray examn. to take place chiefly in the colon. Ba was added to the meal in a certain series of tests. No relationship could be established between the rate of progress of food residues through the intestines, as judged by bead or Ba observations, and the basal gastric secretion. Neither acceleration of the movement of the intestinal contents by the action of paraffin oil, nor retardation by partial ligation of the intestine was followed by any const. change in the basal secretion. L. W. RIGGS

Chloride metabolism of the vivi-perfused stomach. C. L. HOU, TSANG-GI NI AND R. K. S. LIM. Peking Union Med. Coll. *Chinese J. Physiol.* **2,** 299–304(1928).—The av. basal Cl intake of the vivi-perfused stomach is 0.029 mg. per g. of gastric mucosa per min. The basal Cl intake is thus relatively low, but it is higher than can be accounted

for by the quantity of Cl in the basal secretion. After the injection of histamine (to induce an active secretion) the Cl intake of the stomach increases 2 to 15 fold. The summit of this increase occurs earlier than that of the Cl secreted as acid in the gastric juice, indicating that the active oxyntic cells take up an excess of Cl, but later as the secretion subsides, the intake may fall below the output. At this point Cl may be returned to the venous blood. L. W. Riggs

Lipoid metabolism of the stomach and its relation to the mitochondria-Golgi complex. Schmorl M. Ling, A. C. Liu and R. K. S. Lim. Peking Union Med. Coll. *Chinese J. Physiol.* 2, 305–28(1928).—Both basal and active gastric juice contain lipoid, of which about 10% is phospholipin. The lipoid output increases with the secretion. Apparently the non-P lipoid of the juice is extruded chiefly by the oxyntic and the phospholipin by the peptic cells. The basal gastric mucosa contains not more than 3% of lipoid, of which less than half is phospholipin. After 6 hrs. of activity the total lipoid content is unchanged, but the phospholipin fraction increases as do the I nos. of both phospholipin and non-P lipoid fractions. Since in general mitochondria increase and Golgi element decreases after activity, the increase of phospholipin may be assigned to the former and non-P lipoid to the latter. It is possible that as the fatty acids of the mitochondrial phospholipins become more unsatd. during activity, they dissociate, sepg. from the phospholipin mol. and forming Golgi material. The Golgi lipoid may be discharged with the secretion, oxidized or resynthesized. L. W. R.

Further observations on tryptophan and the thyroid gland. Hsi-Chun Chang and Wen-Chao Ma. Peking Union Med. Coll. *Chinese J. Physiol.* 2, 329–36(1928).—The morphology of the thyroid glands of albino rats varies with body wt. The mitochondria vary in no. and shape according to the functional state of the thyroid glands. Tryptophan appears to have no sp. morphological influence on the thyroid gland. From evidence so far accumulated tryptophan is not related to the thyroid hormone. L. W. Riggs

Normal variations of blood chemical constituents in Chinese. Schmorl M. Ling. Peking Union Med. Coll. *Chinese J. Physiol. Report Series 1928*, No. 1, 119–22.—The lower limits of non-protein and urea N for the Chinese are slightly lower and that of sugar is much lower than the American standards, while uric acid and creatinine show practically no difference. The concns. of inorg. salts are the same in both races, except the max. figure for inorg. P of serum, which is slightly higher in the American records. The cholesterol content of the plasma is definitely low, although the fat content shows only a low min. The max. for fibrinogen, albumin and total protein of the plasma are low for the Chinese. The same is true of blood gases. The differences herein noted are slight and may disappear when more observations are available. L. W. Riggs

Nitrogenous metabolism in South China. San-Yin Wong. Univ. Hongkong. *Chinese J. Physiol. Report Series 1928*, No. 1, 123–8.—Analyses of the urines of 12 medical students in the Univ. of Hongkong showed the av. total N only a little lower than the European standard, but about $^1/_3$ higher than that of the Peking students. The urea N as percentage of the total N is lower than the European standard and about the same as that of Peking students. The NH_3 N as percentage of the total N is a little higher than the European standard but considerably lower than that of Peking students, due probably to a dietetic factor. A high creatinine output indicates a high metabolism of the tissues. The abnormally high value for uric acid N may be attributed to the excessive drinking of tea and coffee. L. W. Riggs

Metabolism of the isolated ovary. Alexandre Lipschütz and Serge Vesnyakov. *Compt. rend. soc. biol.* 99, 535–6(1928).—If the ovary of the guinea pig is isolated without a nutritive medium it continues to absorb O even at the temp. of melting ice. The intensity of the metabolism under these conditions is 1/15 to 1/30 of that at body temp., and may remain nearly const. for several days. If the isolated ovary is exposed for a few min. to temps. below 0°, then is removed to room temp., it will have a respiration nearly normal for a few hrs. and then cease to respire. L. W. Riggs

Effect of thyroidectomy and of parathyroidectomy on the functioning of the hemato-encephalic barrier. L. Stern, L. G. Belkina and A. O. Slatowierow. *Compt. rend. soc. biol.* 99, 536–7(1928); cf. *C. A.* 21, 3973.—Ablation of the thyroid in cats was followed by no apparent change in the hemato-encephalic barrier. After 10 days the passage of trypan blue from the blood into the cerebrospinal fluid was observed but NaI and $Na_4Fe(CN)_6$ did not pass. Simultaneous ablation of thyroid and parathyroid or of parathyroid alone was followed within 2 days by the passage of both colloids and crystalloids, which had been injected into the blood, into the cerebrospinal fluid. L. W. Riggs

Effect of blockage of the reticulo-endothelial apparatus on the functioning of the

hemato-encephalic barriers. L. Stern, G. N. Kassil and E. S. Lokshina. *Compt. rend. soc. biol.* **99**, 538–9(1928).—Acute blockage of the reticulo-endothelial app. by 20 cc. of 2% India ink per kg. diminished the resistance of the hemato-encephalic barrier to the passage of Bi. Chronic blockage by injection of India ink during 6 to 7 days has the same effect as acute blockage but more pronounced. Of the various substances, colloidal and crystalloidal, injected into the circulation only Bi passed into the cerebrospinal fluid following the blockage of the reticulo-endothelial system.

L. W. Riggs

Variation of the blood sulfur content in the course of asphyxia. Léon Binet and Réne Fabre. *Compt. rend. soc. biol.* **99**, 577–8(1928).—In 6 dogs acute asphyxia prolonged during 5 min. caused an increase of from 8.22 to 57.37, av. 21.88% in the total S in the arterial blood plasma. This increase is in the neutral S. The sulfates are diminished.

L. W. Riggs

Elimination of nucleoproteins by the bile. P. Carnot and Z. Gruzewska. *Compt. rend. soc. biol.* **99**, 598–600(1928); cf. *C. A.* **21**, 2332.—The const. presence of cholenucleins in the bile indicates a particular function of the liver. The vesicular bile on account of its concn. during its sojourn in the gall-bladder is richer in cholenucleins, biliary acids and pigments. After treatment with large doses of $NaHCO_3$ the cholenucleins diminish to a limit which varies between 0.3 and 0.4%. **Phosphorus content of the cholenucleins.** *Ibid* 600–1.—In the dog the quantity of P eliminated in cholenucleins varies between 8 and 10 mg. per 100 cc. of bile.

L. W. Riggs

The detoxicating hormone of the liver (Yakriton). VI. Proposal of quantitative estimation of hunger injury. Akira Sato. *Tohoku J. Exptl. Med.* **11**, 265–71(1928); cf. *C. A.* **21**, 1141, 1494.—S. emphasizes that the title "quant. estn. of hunger injury" does not mean quant. estn. of some chem. constituent of the body during hunger, but a "quant. detn. of hunger injury itself." The scale selected is the no. of units of Yakriton. Ten rabbit-ammonia units (R. A. U.) raise the rabbits of class *b*(R*b*) to those of class *f*(R*f*) provided they are both feeding. The interval between R*b* (of ordinary detoxicating power) and R*f* (of very active detoxicating power) may be defined as 10 R. A. U. A R*b* remains, when it is made to fast, to be of the class *b*, thus apparently to be of the same detoxicating power as when fed, but 10 R. A. U. does not raise it to class *f* any more, and many more units will be required according to the no. of days of fasting. The interval between class *f* and class *b* has thus become much larger. A R*f* becomes, when it is made to fast for some time, to be R*b*, but then it remains R*b*. Thus it may seem that a R*f* will, when made to fast, come down as far as 10 R. A. U. and stays there in spite of prolonged fasting. But now many more units than 10 R. A. U. will be required to raise it to the original class *f*, and the no. of units is larger as the no. of days of fasting is increased. Accordingly the hunger injury of an apparently healthy animal can be quant. detd. if it is expressed in the no. of units of Yakriton. **VII. Preparation of Yakriton with further experience of potency testing.** *Ibid* 272–6.—An aq. ext. of ox liver is evapd. to a sirup and is extd. with a large amt. of alc.; the alc. ext. is concd. and dazol is added. After shaking the dazol is collected on a filter and is washed with alc. The dazol is now extd. with water, the aq. ext. is evapd. to a small amt. which is extd. with Et_2O. The Et_2O ext. is evapd. to dryness and is dissolved in water, the soln. is repeatedly treated with toluene and then decolorized with charcoal. The soln. thus prepd. is again evapd. to dryness, the residue is dissolved in alc., this alc. soln. is evapd. to dryness and the residue dissolved in water. The soln. thus prepd. is colorless, neutral and does not give the biuret reaction. It can be boiled without loss of potency and it keeps indefinitely. It does not contain any trace of histamine-resembling substances. It is readily sol. in Et_2O, fairly sol. in alc. and rather insol. in water. Further potency tests were made and the following conditions for the standardization were established: (1) Rabbits used for potency testing (both control and Yakriton animals) should be of class *b* at least at 3 successive liver tests made within several days of the potency testing. The animals should not lose wt. during these days. (2) On occasion of potency testing, at least 2 of 3 control animals should become *b* by the intraperitoneal injection of NH_4Cl, while the third rabbit may become *b*, *c*, *d*, *a*, *e* or even *f*. As to Yakriton animals, it is not satisfactory that only 3 from among the group used become *f*. The testing must be continued until 3 *consecutive* rabbits will have turned out *f*. The amt. of ext. used in these last 3 animals contains full 10 R. A. U. of Yakriton per kg. of body wt. (3) A guinea pig should remain without any perceptible symptom, if Yakriton is injected intracardially at once in 100 R. A. U. per hectogram of body wt. **VIII. How to select individuals certain of anaphylactic shock.** Kazue Suzuki and Akira Sato. *Ibid* 277–81.—The liver test devised by Sato and Sakurada was utilized for distinguishing the animals apt to die from anaphylaxis from those more or less refractory. The

method consists in putting sensitized animals to the detoxicating liver test before the final intoxicating injection. A rabbit of class *f* will generally develop a fatal or grave anaphylactic shock while one of class *b* will be more or less refractory. Control animals should be selected from among animals of the same or nearly the same class. **IX. Effect of Yakriton on anaphylaxis.** KAZUÉ SUZUKI. *Ibid* 282–92.—Yakriton, subcutaneously injected repeatedly for several days previous to the intoxicating injection of foreign protein, will make a refractory rabbit so strongly reactive to anaphylaxis, as to cause a fatal shock. Yakriton, subcutaneously injected in a rather large amt. 5 min. before the intoxicating injection of foreign protein, will cause a rabbit which would otherwise be sure of an anaphylactic shock, to be refractory to anaphylaxis Thus by use of Yakriton it is possible to make a given rabbit, very sensitive to anaphylaxis, to be immune to anaphylactic shock, and to cause another rabbit, refractory to anaphylaxis, to be so sensitive to the reaction that the shock is fatal. L. W. R.

Simultaneous determination of the epinephrine liberation, the sugar content and the coagulation time of blood in non-fastened, non-anesthetized dogs after hemorrhage. SHIDZUKA SAITO, BUNKICHI KAMEI AND HIROSHI TACHI. *Tohoku J. Exptl. Med.* **11**, 205–17(1928).—The numerical results fill 10 pages. The max. of the blood-sugar content after bleeding appeared earlier than that of increased epinephrine discharge, or simultaneously. In half of the cases there was a remarkable shortening of the time of blood coagulation. **Relation of the augmented epinephrine secretion after hemorrhage in dogs to the simultaneous occurrence of hyperglucemia.** HIROSHI TACHI AND SHIDZUKA SAITO. *Ibid* 218–32.—Adrenaline was introduced into a vein of a normal dog at a rate, which was chosen to imitate approx. the rate of epinephrine output after hemorrhage of about 1/6 or 2/6 of the total blood vol. The results justify the conclusion that the augmented epinephrine output from the suprarenal bodies after hemorrhage plays at least a highly important role in causing hyperglucemia after hemorrhage.

L. W. RIGGS

Ovarian hormone. E. C. DODDS. Univ. of London. *Lancet* **1928**, I, 1107–10; cf. *C. A.* **21**, 3227.—A highly potent prepn. is described which will produce estrus, cause great enlargement of the genital tract, induce premature puberty and cause abortion and possibly premature labor. It is prepd. as follows. The placenta is hydrolyzed with $Ba(OH)_2$ and the supernatant fluid extd. with C_4H_9OH. The alc. is evapd. off and the residue dissolved in H_2O and this soln. extd. with ether. All protein is removed by shaking this ethereal soln. with HCl. The ethereal soln. is then heated with a small amt. of $Ba(OH)_2$ to render sapon. complete. The ppt. is filtered off and excess of Ba removed by addn. of dil. H_2SO_4. The final H_2O-clear soln. contains the active material. Clinical investigations of this material, which has been carefully standardized on animals, is just about to begin. F. B. SEIBERT

The specific gravity of the blood. Experimental evidence of difference in weight of the blood of the right and left ventricles of the heart. R. J. TERRY AND G. A. SEIB. *Anat. Record* **36**, 279–92(1927).—The blood of the common carotid artery, and perhaps that of the left ventricle, is more dense than is the blood of the right ventricle. Detns. made in fasting cats under urethan anesthesia under conditions providing for normal respiration, pulse and blood pressure gave an av. sp. gr. of 1.0488 for the blood of the right side, of 1.0504 for that of the left side of the heart. The difference between the two bloods was somewhat greater in male animals. G. H. S.

A new hormone of the circulation and its action. III. EMIL K. FREY AND HEINRICH KRAUT. Charité Surg. Clinic, Berlin, and Bayer's Acad., München. *Arch. exptl. Path. Pharm.* **133**, 1–56(1928).—From the urine a substance can be recovered and purified which functions as a hormone markedly influencing the circulation. With effective doses the increase in pulse rate is (av.) 6%, although under certain circumstances the acceleration may be much greater (double the normal rate). The amplitude of the beat is also increased, in some cases as much as 9-fold, the effect persisting for from 0.5 to 10 min. after a single injection. With repeated injections the period is protracted. Immediately after the injection rate of flow is always definitely diminished, but very quickly (20 secs.) the normal vol. is restored and often exceeded. Coincident with the reduction in vol. there occurs a fall in blood pressure (33%) which also is transitory. Apparently the active agent acts through an effect on the heart muscle rather than through the nervous mechanism. With hearts whose action is impaired the hormone appears to exert a regulating influence. Not only are these effects observed when the hormone is injected into the intact animal, but also when it is added to the perfusion fluid used with isolated hearts. This is true of mammalian, not frog, hearts, for while the latter may react to raw urine the purified prepn. is without effect. The hormone exerts a direct effect upon the walls of the capillaries, resulting first in a vasoconstriction fol-

lowed by an increased dilatation of the vessels of the lung, brain, skin and muscles. The vessels of the other organs show a reduction in vol. corresponding to the fall in blood pressure. Intravenous injections of the hormone reduce the blood pressure of the systemic circulation and increase the pressure within the pulmonary system. Upon the non-narcotized animal the hormone has little if any influence upon the respiration, but in the narcotized it causes some slight increase in the respiratory rate. Acting upon kidney function the injected hormone causes an initial fall in secretory activity followed by an increased flow, but the effects are considerably modified by the dosage. When placed in contact with smooth muscle (intestine, uterus) the hormone causes a histamine-like increase in tonus. The characteristic effects are intensified and prolonged by the addn. of small amts. of Ca salts. The hormone is inactivated both *in vivo* and *in vitro* by blood; serum is less effective and less const. in its action. The inactivating agent in blood is a definite substance, very unstable and sensitive to heat and acids. Apparently the active principle of the hormone cannot be identified with any of the known substances which exert similar effects. It can be demonstrated to be present in the blood.
G. H. S.

Psychic stimulation of the posterior lobe of the hypophysis. H. Hoff and P. Wermer. Univ. Wien. *Arch. exptl. Path. Pharm.* **133**, 97–102(1928).—In dogs which are excited by the sight of cats there occurs a considerable increase in the secretion of pituitrin. This explains the inhibition of diuresis. Small doses of luminal or trichloroisobutyl alc. prevent the increased output of pituitrin. G. H. S.

Function of renal tubules. Tahira Fujita. Tokyo Imp. Univ. *Proc. Imp. Acad.* (Japan) **4**, 415–7(1928).—Chloride, which is eliminated practically only from the glomeruli with H_2O, is partly reabsorbed in the tubules with H_2O; while SO_4 and other urinary constituents, such as K, Ca, Mg, PO_4, uric acid and urea, which are eliminated, both from the glomeruli and the tubules as far as any satisfactory demonstration is concerned, are not reabsorbed in the tubules. C. J. West

The occurrence of lead in the egg of the domestic hen. Wilfrid B. S. Bishop. *Med. J. Australia* **1**, 480–8(1928).—The Nessler method for the detn. of Pb in an alk. soln. using a new technic for the detn. of small quantities of Pb is described, and the accuracy of the method detd. Pb found: shell, 0.1 to 1.6 mg. per 100 g. wet material; yolk, 0.2 to 1.0 mg. per 100 g. wet material; white, 0.12 to 0.48 mg. per 100 g. wet material. R. C. Willson

The occurrence of molybdenum in the egg of the domestic fowl: A preliminary communication. Winifred R. Mankin. *Med. J. Australia* **2**, 87(1928).—The method used is a modification of that used by Hall (*C. A.* **16**, 2461) and by Koppel (*C. A.* **14**, 1501). The material is ashed at a fairly low temp. in porcelain and transferred to Pt. Previous expts. have shown that extn. with HCl or *aqua regia* was not satisfactory. The ash is treated with NH_4NO_3 and then with a mixt. of NH_4NO_3 and Na_2CO_3 (1:2). After cooling, an aliquot is dissolved in a min. quantity of H_2SO_4 and made just alk. with NaOH, the total vol. being less than 5 cc. From 0.3 to 0.5 g. of solid K xanthate is dissolved in the soln. and a few drops of 10% H_2SO_4 added, the tube being agitated after the addn. of each drop, till a purple color develops. The av. Mo content of the whites of 18 eggs is 0.01 mg. per 100 g. egg white, the color having the same intensity as that given by 0.01 mg. of Mo as $(NH_4)_2MoO_4$. No definite results for egg yolk have been obtained. No purple coloration was given when known mixts. were used contg. Fe, Sr, Mg, Pb, K, Cr, Co, I, B, U, Ni, As, Hg, V, Br, Cl and PO_4, SO_4 and NO_3.
R. C. Willson

The effect of iodine on milk secretion. E. Maurer and H. Ducrue. *Münch. med. Wochschr.* **75**, 249–51(1928).—Tests were made to det. possible changes in milk compn. due to a single large dose of I. A nurse was tested 3 days for the quantity of milk secreted daily. Then 0.6 g. KI was given daily for 7 days. The quantity of excreted milk was not changed, but the I content far exceeded the normal 2.6γ%. During the first 3 days 15% of the administered I was eliminated. The milk participated in the I output. During the last 5 days, the I content of the milk was above normal. The quantity of fat-free dry mass was slightly increased; this is attributed to an increase in protein content. The blood sugar content was increased. The increase in ash was most marked and indicates that the addn. of I to the food stimulates the elimination of mineral matter in the milk. Fat was decreased. There is reason to believe that fat decrease runs parallel with the increase in I dosage. R. C. Willson

G—PATHOLOGY

H. GIDEON WELLS

Survey on the metabolism experiments on carcinoma tissue. E. HAAGEN. *Arb. Reichsgesundh.* 59, 429–43(1928). G. SCHWOCH

Effect of kidney on blood regeneration in pernicious anemia. W. S. MCCANN. *Proc. Soc. Exptl. Biol. Med.* 25, 255–8(1928).—Two patients with pernicious anemia, who were fed diets contg. 250 g. of kidney daily, were improved after 17 and 27 days of the treatment. The blood counts showed marked regeneration. The relative values of kidney and liver feeding can be detd. only on comparison of a long series of cases. C. V. B.

The adaptation in vitro of diphtheria bacillus to specific antitoxin. CLAUS W. JUNGEBLUT. Stanford Univ. *Proc. Soc. Exptl. Biol. Med.* 25, 427–9(1928).—Two diphtheria strains cultivated in a specific antitoxin medium underwent complete loss of toxin production. The atoxic filtrate of one strain, if given in a single subcutaneous dose of 2 cc., failed to induce the formation of antitoxin in guinea pigs within the period of 3 weeks, as measured by intracutaneous tests. Flocculation reactions were carried out by combining the atoxic filtrates of the 2 adapted strains with diphtheria antitoxic serum. The atoxic filtrates flocculated much less than the corresponding control toxins. However, some definite flocculation did occur with these atoxic and non-antigenic filtrates. The evidence so far suggests that these atypical properties acquired during exposure to specific antitoxin are transitory. C. V. B.

Passive sensitization with Maignon's fraction of anaphylactic blood. W. H. MANWARING, J. L. AZEVEDO AND H. C. TORBERT. Stanford Univ. *Proc. Soc. Exptl. Biol. Med.* 25, 431–2(1928).—Maignon's pptn. and extraction technic was applied to 9 canine anaphylactic bloods and to emulsions of 6 hypersensitive livers. Eleven of the products obtained were wholly inert. Two of the blood products and 1 liver product gave slight passive hypersensitiveness and 1 blood product gave a very severe anaphylactic phenomenon, which, however, had not the symptomatology and autopsy findings of a typical anaphylaxis. It is probable that this was an atypical hypersensitive phenomenon of unknown nature. C. V. B.

A simplified serological test for tuberculosis. ADELAIDE B. BAYLIS. Columbia Univ. *Proc. Soc. Exptl. Biol. Med.* 25, 482–3(1928).—A test for tuberculosis is described, based on the Vernes principle of a periodic sinusoidal curve of ppt. It lacks the delicacy of the Vernes technic, but is capable of giving diagnostic information and requires only inexpensive equipment. C. V. B.

Difference in susceptibility of mice and rats to experimental production of amyloidosis. BALDWIN LUCKE AND L. A. MARKLEY. Univ. of Penn. *Proc. Soc. Exptl. Biol. Med.* 25, 642–6(1928).—Amyloidosis was produced in 75% of mice by injections of alkali caseinate solns., while entirely neg. results were obtained in rats. The mice suffered in health from the injections, while the rats thrived. Possibly the breaking down of tissue proteins in the rats was not sufficiently severe to lead to amyloid formation. C. V. B.

Studies on anaphylaxis with the products of peptic digestion of protein. II. KARL LANDSTEINER. Rockefeller Institute. *Proc. Soc. Exptl. Biol. Med.* 25, 666–7(1928).—Animals sensitized with peptic digestion products of egg globulin were more sensitive to these than to unchanged globulin and *vice versa*. After pptn. with trichloroacetic acid and alc. the resulting substance was much more toxic for the guinea pigs sensitized with the digested material than for those sensitized with globulin. Similar results were obtained by sensitizing with digested heat-coagulated egg globulin. C. V. B.

Experimental ulcer of the colon in rats. W. M. BALDWIN. Albany Medical College. *Proc. Soc. Exptl. Biol. Med.* 25, 679–81(1928).—After several subcutaneous injections of a soln. of mercurochrome 220 soluble into white rats, examn. at autopsy revealed staining of the tissues with the dye, marked histologic changes in the kidneys and colitis and enteritis. In addn. a const. ulcer was identified upon the median wall of the ascending colon, directly cephaled to the iliocecal valve. A theory as to the mechanism of this ulcer production is given. C. V. B.

Preparation of relatively stable emulsions with Kahn antigen base. B. S. KLINE. Mt. Siani Hosp., Cleveland. *Proc. Soc. Exptl. Biol. Med.* 25, 689–92(1928).—Kahn antigen base when concd., chilled and used according to a formula described yields thoroughly satisfactory emulsions that retain their antigenic properties undiminished in pptn. tests for syphilis for 3 days. These emulsions are superior to Kahn antigen dilns. in tests made at room temp. in giving no false clumping. Because more cholesterol

may be dispersed in a given total by the new formula, it is possible to make the emulsions more sensitive, yet no less specific, than Kahn antigen dilns. from the same ext. C. V. B.

Effect of liver extract on erythrocytes and reticulocytes in normal individuals. CHARLES H. WATKINS, RICHARD JOHNSON AND HILDING BERGLUND. University Hosp., Minneapolis. *Proc. Soc. Exptl. Biol. Med.* **25**, 720–3(1928).—Liver ext. in normal individuals, as in pernicious anemia, brings about an immediate release of red blood cells into the circulating blood. In the normal individual the maturation of the cells is complete and the release rapid; in pernicious anemia the maturation is retarded, discharge of incompletely matured cells occurs and precedes the discharge of fully matured ones; the process as a whole is prolonged. C. V. B.

Effect of intravenous bacterial filtrates on skin tests and local infections. FRANKLIN M. HANGER, JR. Presbyterian Hosp., N. Y. *Proc. Soc. Exptl. Biol. Med.* **25**, 775–7(1928).—When filtrates of strains of *B. lepis epticum* and other Gram-negative strains are injected intravenously, the reaction is quite different in the allergic and non-allergic rabbit. The symptoms are given in detail. C. V. B.

Variability in distribution of allergic skin response. H. L. ALEXANDER. Washington Univ. *Proc. Soc. Exptl. Biol. Med.* **25**, 800–3(1928).—When a given amt. of allergen is injected successively at various sites in the skin, there is a marked variation in the size of the resulting wheals. The responses on the back and abdomen tend to be larger than elsewhere. From similar results with injections of histamine into the skin of dogs, it is conceivable that the variations in allergic wheal formation in human skin are due to lack of uniform response on the part of the skin capillaries to the same stimulus, rather than to an uneven distribution of antibodies in the skin cells. C. V. B.

Rapid stimulation of hemoglobin synthesis in secondary anemias after feeding fetal calf liver. HILDING BERGLUND, CHARLES H. WATKINS AND RICHARD JOHNSON. University Hosp., Minneapolis. *Proc. Soc. Exptl. Biol. Med.* **25**, 814–7(1928).—A procedure to accelerate the hemoglobin synthesis in secondary anemia through the feeding of fetal calf liver has been carried out successfully. C. V. B.

Significant difference in response of pernicious anemia to fetal calf and beef liver feeding. HILDING BERGLUND, CHARLES H. WATKINS AND RICHARD JOHNSON. University Hosp., Minneapolis. *Proc. Soc. Exptl. Biol. Med.* **25**, 834–5(1928).—An instance is presented of complete maturation of erythrocytes during the whole of an induced rapid remission in a typical severe case of pernicious anemia. This was produced by feeding powdered fetal calf liver. Beef-liver ext. had produced a transitory slight increase in erythrocytes, reticulocytes and megaloblasts, and was unsuccessful in producing a complete remission. C. V. B.

Statistical significance of erythrocyte counts during responses to liver extract in normal individual. HILDING BERGLUND, CHARLES H. WATKINS AND RICHARD JOHNSON. Univ. of Minnesota. *Proc. Soc. Exptl. Biol. Med.* **25**, 835–8(1928).—Erythrocyte counts were made on a normal man at 3-hr. intervals during the day before liver ext. was fed and during 6 days' feeding of Cohn-Minot liver ext. The differences of the mean counts at different times of the pre-liver day were found to be statistically insignificant. On the liver-feeding days the differences showed a high statistical significance, and the liver ext. appeared to have a marked effect on the counts. A series of reactions occurred periodically in 24 hrs. A strong factor appeared to be present tending towards increasing the concn. of circulating erythrocytes; this factor evidently checked by a force aiming to preserve a lower level of erythrocytes. The latter force appears to gain on the former, leaving the person with a lower level at the end of the expt. than at the beginning. C. V. B.

Composition of antigen-precipitin precipitate. HSIEN WU, LAN-HUA CHENG AND CHEN-PIEN LI. Peking Union Med. College. *Proc. Soc. Exptl. Biol. Med.* **25**, 853–5 (1928).—The antigen-precipitin ppt. probably has a const. compn. and the reaction between the antigen (*a*) and the precipitin (*p*) is probably chem. and not merely phys. or colloidal. The assumption that the ppt. contains the *a* and *p* (protein) and no other protein seems justified; otherwise it would be hard to explain the constancy of the hemoglobin content of the ppt. C. V. B.

Comparative toxicity of sera of arterial and venous blood. A. LUMIÈRE AND R. H. GRANGE. *Compt. rend.* **186**, 1064–6(1928).—The toxicity of human and dog's blood sera when injected into guinea pigs is due not to the presence of a poison but to the flocculation of the plasma colloids by those of the heterogeneous serum. The toxicity is lost either by keeping the serum at the ordinary temp. for several days or by exposure to a vacuum. This is due to the loss of CO_2, since, in agreement with this view, the injection of serum prepd. from the venous blood of a dog causes violent

convulsions, quickly followed by death, whereas the injection of the same dose of serum prepd. from arterial blood has very little or no effect. B. C. A.

Occurrence and detection of arginine in cystinuria. F. A. Hoppe-Seyler. *Deut. Arch. klin. Med.* **154,** 97–106(1927).—Arginine was detected in the urine in cystinuria by pptn. with flavianic acid, decompn. of the ppt. with $Ba(OH)_2$, purification with phosphotungstic acid, and treatment of the filtrate with $CuCO_3$, forming *d*-arginine-Cu nitrate. B. C. A.

Iodine problem and exophthalmic goiter prophylaxis from the point of view of agricultural chemistry. K. Scharrer. *Münch. med. Wochschr.* **74,** 1788–90(1927).—Administration of NaI in the fodder of goats and cows considerably increases the I content of the milk and blood, and larger quantities increase the yield of milk. The milk obtained after moderate administration of I is readily tolerated by infants. Application of fertilizers contg. I considerably increases the I in plants. B. C. A.

Azotemia and Becker's xanthoproteic reaction in nephritics. Flamminio Ricci. Univ. Rome. *Arch. farmacol. sper.* **45,** 153–72(1928).—The retention of phenols and aromatic hydroxy acids in the blood as shown by Becker's xanthoproteic reaction is probably a better measure of renal insufficiency than is the urea content of the blood. No strict quant. relationship exists between the phenol concn. of the blood and the seriousness of the kidney lesions, but in general a high phenol content accompanies acute renal insufficiency. On the other hand, azotemia and phenol concn. bear no definite relationship to each other, since low urea concn. with high phenol may be observed, and *vice versa*. In testing kidney function 1 g. of urea administered orally is a useful diagnostic agent. With acute renal insufficiency azotemia is then observed often accompanied by increased intensity of the xanthoproteic reaction, while with mild cases the resulting diuresis diminishes the urea content of the blood. A. W. Dox

The nitrite reaction for diagnosis of infections of the urinary tract in obstetrics and gynecology. F. d'Aprile. Univ. Rome. *Arch. farmacol. sper.* **45,** 177–86 (1928).—The nitrite reaction (red color with *p*-$H_2NC_6H_4SO_3H$ and α-$C_{10}H_7NH_2$) in urine may be of value for detecting bacterial infections of the urinary tract. In case the reaction is neg. a control test should be made after adding a few drops of $NaNO_2$ soln. and incubating 1–2 hrs. at 37°. If the reaction is pos. a bacterial infection is practically certain. A. W. Dox

Physiochemical studies of the pathology of blood serum. II. I. M. Goldberg. Univ. Baku. *Z. ges. exptl. Med.* **55,** 413–24(1927).—The zones of pptn. for serum were studied with lactic acid buffers (cf. *C. A.* **22,** 4163). The addn. of agar, talc, peptone and gum arabic to the serum increased the zone of pptn. Gum arabic injected into rabbits increased the zone of pptn. of the serum. Bubbling CO_2 through the serum increased the zone of pptn., while bubbling air diminished the zone. G. suggests that the broadening of the zone of pptn. of globulins seen so often in pathologic conditions is due to acidosis. F. L. Dunn

Biochemistry of hemolysis with a description of the acetone method of separating analytically the components of the serum and the localization of antibodies in immune area. M. Piettre and A. Chrétien. *Collection of Works on Comparative Pathology* **1927,** 76; *Rev. hyg. med. prev.* **50,** 712(1928); cf. *C. A.* **22,** 3453.—A review of the literature stressing the importance of the proteins in this study was made. Exptl. data indicate only progress in the soln. of the complex problem here outlined. C. R. Fellers

Agglutination and colloidal reactions. F. W. Mulsow. *Proc. Iowa Acad. Sci.* **34,** 85 (1927).—A preliminary report of results which suggest that the agglutination reaction is dependent upon changes in surface tension and other colloidal properties. Alkalies have a stronger inhibiting action than acids. NH_4OH has very little effect as compared to NaOH or KOH. The weak acids, however, have as strong an inhibiting action as the stronger acids. Lactic and butyric acids inhibit in high dilns. Certain colloidal solns. have distinct inhibiting action such as soap soln., 5% acacia soln. and dil. solns. of agar. Egg albumin makes the reaction slower but does not prevent agglutination. Other substances which inhibit the agglutination reaction by their presence are saponin, bile and bile salts as Na taurocholate and Na glycocholate. W. G. Gaessler

Plasma chlorides in acute intestinal intoxication of children. G. L. Boyd. *Am. J. Diseases Children* **31,** 514–9(1926); *Physiol. Abstracts* **11,** 421.—Hypochloremia has been shown to be assocd. with severe fluid loss and with circulation of toxins of split protein nature. In 66 cases of acute intestinal intoxication with both factors

present hypochloremia was found in less than half. No relation was found between the degree of toxemia and the chloride concn. H. G.

The metabolism of salts in nephritis. G. L. Boyd, A. M. Courtney and I. F. Maclachlan. *Am. J. Diseases Children* **32**, 29–39(1926); *Physiol. Abstracts* **11**, 484.—The children were kept on a whole-milk diet, and the blood and excreta analyzed. Blood phosphates were usually increased and blood Ca was decreased in nephritis: the Ca balance was independent of blood Ca content, and was usually pos. High-blood phosphate usually accompanied acidosis, but the phosphate balance depended on the presence or absence of edema. The relation between Ca and phosphate is discussed. H. G.

Metabolism of salts in nephritis. II. Potassium, magnesium and sulfates. G. L. Boyd and A. M. Courtney. *Am. J. Diseases Children* **32**, 192–9(1926); *Physiol. Abstracts* **11**, 484.—Plasma K remains normal whatever the type of nephritis, and the kidney excretes the salts normally. Plasma Mg is always low, but the neg. balance due to excessive loss of the salts from the body is modified by the presence of edema. Usually there is evidence of sulfate retention, but this is not due to defective urinary excretion. H. G.

Metabolism of salts in nephritis. III. Chlorides and sodium. G. L. Boyd, A. M. Courtney and I. F. Maclachlan. *Am. J. Diseases Children* **34**, 218–33(1927); *Physiol. Abstracts* **13**, 98; cf. preceding abstr.—Chlorides and Na were detd. in the food, feces, urine and plasma in various types of nephritis. It was found that no consistent relationship exists between the ability of the kidney to conc. urinary chlorides and its response to other functional tests. Except in chronic azotemic nephritis, the plasma chlorides and the plasma Na are usually high. Edema and vomiting affect the values. H. G.

Action of hydrolyzed and autolyzed organs and tumors of mammals and fowls. A. H. Roffo and L. Garcia Velloso. *Bol. inst. med. exptl.* **3**, 553–61(1927); *Physiol. Abstracts* **13**, 122.—Although fresh exts. of tissues and tumors cause a fall in blood pressure with death, hydrolyzates and autolyzates are said to have no effect. H. G.

The diagnostic value of the sugar content in the cerebrospinal fluid. A. S. Giordano. *J. Lab. Clin. Med.* **12**, 858–64(1927); *Physiol. Abstracts* **12**, 566.—Estns. made by the Folin-Wu method show that the sugar normally ranges between 60 and 90 mg. per 100 cc. of fluid. The sugar content offers no differentiation between poliomyelitis, encephalitis, brain tumor and other non-bacterial affections of the central-nervous system, but in meningitis it is always lowered. The differential diagnosis of tuberculous and purulent meningitis is discussed. H. G.

Muscular exercise and insulin requirement in diabetes. A. Gerl and A. Hofmann. *Klin. Wochschr.* **7**, 59–63(1928); *Physiol. Abstracts* **13**, 100.—The blood sugar was detd. periodically throughout the day in 5 cases of diabetes receiving insulin. On days when muscular exercise was carried out the blood-sugar level was not higher in general, than when no exercise was taken. In some instances it was definitely lower. Conclusion: Muscular exercise tends to lower the insulin requirement and is therefore useful. The reasons for the favorable influence of exercise are discussed. H. G.

The relationship between the severe blood poisons and the catabolites of protein. The mechanism that causes pernicious anemia. F. Rosenthal, L. Wislicki and L. Kollek. Med. Univ. Klinic, Breslau. *Klin. Wochschr* **7**, 972–7(1928).—The blood picture that is obtained after chronic poisoning with NH_2OH and $BzNHNH_2$ is almost identical with that observed in pernicious anemia. The hydroxylamine group appears to be the agent that is responsible for the production of abnormal blood cells. Certain amines have long been considered to be blood poisons; but the real toxic agent is the hydroxylamine deriv. that is formed from the amine in the liver. Pernicious anemia may be caused by such oximes produced, in the liver, from protein cleavage products. All hydroxylamines are not blood poisons. Thus MeNHOH-COOH, iso-AmNHOHCOOH and MeNHOH are not blood poisons. $PhCH_2CH$-(NHOH)COOH does not, regularly, produce blood changes; but PhCH(NHOH)-CH_2COOH is a powerful blood poison. Of considerable physiol. significance is the fact that $PhCH_2NHOH$ and especially $NH_2CONHOH$ are severe blood poisons. The latter could, under abnormal metabolic conditions, quite possibly be produced from urea. Milton Hanke

Toxic action of diastase and cell injury. Kurt Boshamer. *Klin. Wochschr.* **7**, 978–80(1928).—Necrosis of the pancreas leads to the appearance of trypsin and amylase in the blood. Amylase is not toxic to normal tissue; but leads to an increased destruction of injured tissue. Milton Hanke

The bactericidines of the intestinal juice. Kurt Meyer and Walter Löwen-

BERG. Rudolf Virchow Hospital. *Klin. Wochschr.* **7,** 984–7(1928).—Duodenal juice is bactericidal. The bactericidal substance is thermostable to an unusual degree. Some samples of intestinal juice retain their bactericidal properties to a large extent even after boiling for 30 min. The ash is inactive. The juice retains its activity when it is passed through a Berkefeld filter or when it is dried *in vacuo.* The bactericidal substance is not inorganic, it is not a protein, it may be a colloid, but, if so, the degree of dispersion is high, and it is not a lipoid. The bactericidal action of intestinal juice varies considerably; but this property cannot be correlated with the enzyme content of the juice. MILTON HANKE

Tissue respiration in cases with metabolic disturbances or with diseases of the organs of internal secretion. ERNST LUCAS. Urban Hosp., Berlin. *Klin. Wochschr.* **7,** 991(1928).—The spectroscopic method of Meyer and Rheinhold was employed (cf. *C. A.* **21,** 123). Observations were made on the web tissue between the thumb and index finger. Hemoglobin is normally reduced in 2 to 3 minutes in the clamped web. In Basedow's disease the time of reduction is decreased to from 50 to 90 secs. In myxedema the time may be increased to 5 min. Obesity is associated with a long reduction time (about 3 to 3.5 min.). This method is simple, is not time-consuming, and is just as reliable an index of the basal metabolic rate as the respiration methods. MILTON HANKE

Allergy, anaphylaxis and idiosyncrasy in dermatology. BRUNO BLOCH. *Klin. Wochschr.* **7,** 1065–70(1928).—A review. MILTON HANKE

New carcinoma reactions and their clinical usefulness. KURT ATZERODT. *Klin. Wochschr.* **7,** 1076–8(1928).—A careful study of the albumin reaction of Surányi and of the dye reactions of A. Gross. None of these reactions gives reliable clinical information as to the presence of carcinoma. MILTON HANKE

The nature of allergens. II. Pollen of Dactylis glomerata. L. FARMER LOEB. Med. Clinic, Charité, Berlin. *Klin. Wochschr.* **7,** 1078–9(1928); cf. *C. A.* **22,** 3692.—An aq. ext. of *Dactylis glomerata* gives a pos. skin reaction with certain hay fever patients. Addn. of alc. to this aq. ext. produces a ppt. which is active. The alc. filtrate in inactive. Tryptic digestion of the alc. ppt. destroys the active substance. The allergene of *Dactylis glomerata* is a protein. MILTON HANKE

Experimental sensitization and allergic reactions of the skin toward myoarsphenamine. E. NATHAN AND ANTON MUNK. *Klin. Wochschr.* **7,** 1125–8(1928).—Myoarsphenamine in 1% soln., can be injected intradermally without irritation. A local reaction is obtained in patients that are sensitive to arsphenamine. A generalized sensitization of the skin occurs in some patients so that the site of primary injection flares up upon reinjection of a new area 8–10 days later. In 2 cases the skin sensitization was so severe that a generalized urticarial exanthema was produced. MILTON HANKE

Glycogen, glucose and lactic acid content of benign and malignant tumors. FR. BERNHARD. *Klin. Wochschr.* **7,** 1184–5(1928).—The glucose concn. in benign and in malignant tumors is identical. Malignant tumors contain 10 times as much glycogen as do the benign tumors. The lactic acid content of malignant tumors is higher than that of benign tumors. Lactic acid determinations in the blood are of no value for the diagnosis of carcinoma. MILTON HANKE

The pathophysiology of fat metabolism after splenectomy. SAMUEL LEITES. Med. Inst. of Charkow. *Klin. Wochschr.* **7,** 1186(1928).—The ingestion of 100 g. oleic acid (dog) after splenectomy leads to an elevation in the β-hydroxybutyric acid and acetoacetic acid content of the blood from the right heart and the femoral vein and artery. The ingestion of olive oil or of olive oil plus cholesterol, after splenectomy, does not usually lead to an elevation of the ketone body concn. in the blood from the right heart; but does lead to an increase in the "acetone bodies" in the blood from the femoral vein and artery. MILTON HANKE

The relationship between the parotid, pancreas, blood sugar and diabetes mellitus. S. SEELIG. Charite, Berlin. *Klin. Wochschr.* **7,** 1228–30(1928).—Ligation of the ducts of the parotid gland leads to a reduction in the blood-sugar concn. The hyperglucemia produced in dogs by pancreatectomy cannot, however, be greatly modified by ligating the parotid ducts unless the ligation is carried out some time before pancreatectomy. Of 10 cases of human diabetes in which the parotid glands were ligated, 7 showed signs of improvement and three did not. MILTON HANKE

The serological diagnosis of syphilis by flocculation of cholesterolized extracts. (Citochol reaction and lentochol reaction). H. SACHS AND E. WITEBSKY. *Klin. Wochschr.* **7,** 1233–4(1928).—The modification consists in using a more concd. (3 times) alc. ext. of beef heart that is then properly cholesterolized. The reaction is rapid; hence it is

referred to as the citochol reaction as against the slower process, using non-concd. beef heart exts., which is called the lentochol reaction. M. H.

Action of liver diet on the erythrocyte and the cholesterol content of blood. WILH. BECK. *Klin. Wochschr.* **7,** 1235–6(1928).—Severe, secondary, post-hemorrhagic anemias, the anemia associated with malignant tumors, anemia of aleukia hemorrhagica, constitutional anemia of twins, anemia of hypothyreosis are not beneficially influenced by a liver diet or by liver exts. Mild secondary anemias (tuberculosis, endocarditis), alimentary anemia of children, anemia of scurvy or rickets and pernicious anemia are benefitted by the liver diet. The erythrocyte count of normal individuals can be raised from 4.5 to 6.7 million. The cholesterol content of the blood is elevated to above normal in all cases that are benefitted by the liver diet. The resistance of the erythrocytes is increased as the cholesterol content increases. MILTON HANKE

Measurement of the oxygen tension of the urine and its significance for the pathology of the circulation and the kidney. FRITZ MAINZER. Hospital, Altona a. Elbe. *Klin. Wochschr.* **7,** 1277(1928).—The concn. of O in the urine must bear a direct relationship to the O tension of some place in the body, probably the kidney. It should, therefore, undergo a change in certain diseased conditions. In 4 cases of severe decompensated vascular disease the O tension of the urine was found to be markedly subnormal. MILTON HANKE

Variations in the potassium and calcium content of serum in dermatitis. E. NATHAN AND FR. STERN. *Klin. Wochschr.* **7,** 1375–6(1928).—A brief report. The detailed report is to appear in the *Arch. Dermatol. u. Syphilis* **1928.** M. H.

Metabolism in pernicious anemia particularly after treatment with liver. K GRASSHEIM. Charité, Berlin. *Klin. Wochschr.* **7,** 1424–5(1928).—Pernicious anemia is associated with an increased basal metabolic rate. The O consumption usually becomes normal as the blood becomes normal on a liver diet. There are cases, however, in which the liver treatment leads to a normal blood picture; but the O consumption remains high. MILTON HANKE

Changes in the concentration of potassium, calcium and choline in the blood during an attack of angina pectoris. D. DANIELOPOLU AND MARIA MAXIM. *Klin. Wochschr.* **7,** 1466–7(1928).—Blood K and choline are markedly increased (Ca normal) during an attack of angina pectoris. The K and choline concns. regain their normal values 0.5 hr. after the attack has subsided; Ca is increased above normal. These results are identical with those obtained by stimulation of the sinus caroticus in animals. MILTON HANKE

Cholesterol metabolism. H. BEUMER AND F. HEPNER. *Klin. Wochschr.* **7,** 1470(1928).—Cholesterol that is injected intravenously is not excreted by the liver into the gall bladder. It appears to be excreted into the intestinal tract. Bacteria can synthesize cholesterol. A portion of the cholesterol that is found in feces must, therefore, be of bacterial origin. MILTON HANKE

The treatment of diabetes with a low fat diet. III. High carbohydrate diets in the treatment of emaciated diabetics. D. ADLERSBERG AND OTTO PORGES. *Klin. Wochschr.* **7,** 1503–7(1928).—A high carbohydrate, low fat diet, given in conjunction with insulin leads to a rapid tissue reconstruction in emaciated diets. The blood sugar may be increased; but a compensatory rise in the kidney threshold occurs which prevents excessive glucosuria. MILTON HANKE

Fever, thyroid and adrenals. Experiments on cats. W. BORCHARDT. *Klin. Wochschr.* **7,** 1507–9(1928).—The chem. fever induced by tetrahydronaphthylamine and the infection fever produced by pneumococci are not reduced materially by removal of the thyroid and parathyroid glands. The same is true when the adrenals are removed. Fever cannot be produced in normal cats (but can be produced in pregnant animals) that have had the thyroid, parathyroid and adrenals removed. Animals that have been treated with thyroxine or with ephetonin become somewhat feverish when the 3 above-mentioned glands are removed. Decapitated or decerebrated animals do not become feverish. MILTON HANKE

The stomach as a regulator of the acid-base balance. MICHAEL BAKALTSCHUK. *Klin. Wochschr.* **7,** 1551–3(1928).—Inhalation of air to which 3 to 5% of CO_2 has been added leads to a condition of general acidosis and a compensatory secretion of HCl by the gastric mucosa. The stomach is called upon, in this manner, to assist in controlling the acid-base balance in the body when other mechanisms have failed. M. H.

Significance of the non-fermentable reducing substances of the blood in diabetes. ISRAEL M. RABINOWITCH. Montreal General Hospital. *Biochem. J.* **22,** 753–7(1928).—The metabolism of non-fermentable substances is not disturbed in diabetes (cf. Folin, *C. A.* **21,** 122). BENJAMIN HARROW

Amino acids of flesh. II. Comparison of the diamino-acid content of some normal and pathological tissues. JOHN LEWIS ROSEDALE. St. Thomas' Hospital Med. School, London. *Biochem. J.* **22,** 826–9(1928).—No essential differences are obtained in using either Kossel or Van Slyke's method for detg. the diamino-acid method of animal tissues. Low content of lysine has been found in carcinoma, and in chickens which have derived the whole of their food-protein from maize. B. H.

Further studies of the relation of Bacillus acidophilus to dental caries. III. RUSSELL W. BUNTING, MARY CROWLEY, DOROTHY G. HARD AND MARGARET KELLER. Univ. Michigan. *Dental Cosmos* **70,** 1002–9(1928).—The growth of *Bacillus acidophilus* and the occurrence of dental caries are markedly reduced by a well-balanced diet practically free from sugar and candy, use of hexylresorcinol as a mouth wash, and topical application of metaphen after oral prophylaxis. JOSEPH S. HEPBURN

Calcium oxalate as a foreign constituent of salivary calculus. BERNARD B. BADANES. *Dental Cosmos* **70,** 1018–9(1928).—Ca oxalate may occur in salivary calculus. It is formed by a reaction between sol. oxalates in the food and Ca salts of the saliva. JOSEPH S. HEPBURN

Mottled enamel: report of an examination of an afflicted district in Italy. FREDERICK S. MCKAY. *J. Dental Research* **8,** 353–65(1928); cf. *C. A.* **21,** 2707.—Conclusive evidence was obtained that the water used during the years of growth of the enamel of the teeth is the one etiological factor in the occurrence of mottled enamel. JOSEPH S. HEPBURN

Anaerobic-delayed heat production after a tetanus. W. HARTREE AND A. V. HILL. Univs. Cambridge and London. *Proc. Roy. Soc.* (London) **B103,** 207–17(1928).—The anaerobic-delayed heat production after a tetanus may be due to phosphate changes or, more probably, to overstimulation of some of the muscle fibers and the resulting delayed formation of lactic acid. A muscle may give an excellent response to stimulation after hours in an atm. of N_2 contg. HCN. JOSEPH S. HEPBURN

The attraction of lymphocytes by homeotoxins. R. J. CROSSEN. *Arch. Path.* **6,** 396–403(1928).—If one carries out in the same animal an autotransplantation of cartilage and one of lymph gland, and places both transplanted tissues in close proximity to each other, the lymphocytes of the lymph node remain inactive, because the individuality differentials are identical in both tissues and the autosubstances do not exert a stimulating action on the lymphocytes. If by the same method one combines an autotransplanted lymph node and a piece of homeotransplanted cartilage, one may, under favorable conditions of experimentation, observe a definite migration of the lymphocytes from the lymph gland toward and into the transplant; in this case the individuality differential of the cartilage differs from that of the lymph node, and, as a result of this difference, homeotoxins develop which attract the cells from the lymph node in the direction of the cartilage. In the accumulation of lymphocytes around a homeotransplant, one has, in all probability, to deal with a chemotropic reaction. HARRIET F. HOLMES

The microscopic changes of heterophile skin reactions. The pathology of heterophile skin reactions. W. W. REDFERN. *Arch. Path.* **6,** 585–94(1928).—A microscopic study was made of the reaction produced by the injection of heterophile antiserum into the skin of the normal guinea pig. The early changes observed were capillary hemorrhage and extensive thrombosis of the minute vessels. Beginning necrotic degeneration of connective tissue elements was also evident. When coagulation of the blood was prevented by the use of heparin, the reactions developed as usual and ecchymosis was still pronounced. This indicated acute early injury to capillary endothelial cells. It is evident that injury and death of the cell take place rapidly after the antigenic and antibody factors have combined. That neither factor is, of itself, toxic has been shown that a new substance which is toxic results from the reaction between antigen and its specific antibody seems possible, but this has not been clearly proved. Thus far R. has been unable to produce a toxic substance by the combination of heterophile antigen and antibody *in vitro.* While the injection of normal serum led to a strong leucocytic response, immune serum showed an apparent lack of chemotactic power. HARRIET F. HOLMES

Heterophile antigen in human blood. I. DAVIDSOHN. *Arch. Path.* **6,** 632–7 (1928).—The results confirm the opinion of previous writers that the heterophile antigen present in human blood, type A, has common receptors with the Forssman antigen in sheep blood, but is not identical with it. HARRIET F. HOLMES

The influence of dietetic factors on the intensity of symptoms produced during acute experimental nephritis. S. J. COWELL. *Brit. J. Exptl. Path.* **9,** 164–70(1928).—A diet composed entirely of cabbage affords considerable protection from the severe toxic

effects that may be produced by small doses of U nitrate in rabbits fed on an ordinary lab. diet of oats, bran and a small allowance of green food. It is suggested that this protective effect of the cabbage diet is not due to its low protein content, nor to its capacity for producing an alk. urine. Attempts have been made to sep. from whole cabbage some fraction which contains a protective factor, and though the evidence is not completely conclusive, such a factor appears to be present in a watery ext., and may possibly exist in a dialyzed watery ext. HARRIET F. HOLMES

The action of vibrion septique and B. welchii toxin on isolated organs. G. A. H. BUTTLE AND J. W. TREVAN. *Brit. J. Exptl. Path.* **9**, 182–98(1928).—Small doses of septique and Welch toxin cause a spasmodic contraction of rabbits' uterus *in vitro* and a diminution of the size of spontaneous contractions, and the normal contraction to adrenaline is diminished. The toxin of v. septique is destroyed by bubbling air, O or H through the Ringer soln. The action of the *B. septique* toxin is reversible as the normal condition is restored by washing with Ringer's soln. and by adding a large amt. of serum. The concn. of toxin producing effects on smooth muscle in aerated Ringer's soln. is of the same order as that in the blood of a rabbit receiving an av. lethal dose. A small dose of v. septique toxin added to a bath of oxygenated Ringer's soln. contg. a piece of uterus renders the tissue insensitive to the action of larger doses of either v. septique or *B. welchii* toxin. The important part of the action of the 2 toxins is specific in that they are neutralized by the appropriate antisera and not by other antisera. There is a trace of non-specific toxic material in both toxins. By using this effect titrations of antitoxin potency of sera have been carried out. Uteri from rabbits immunized against v. septique toxin reacted to the toxin in the same way as normal uteri. HARRIET F. HOLMES

The preparation of antigenic specific substance from Staphylococcus pyogenes aureus. H. B. DAY. *Brit. J. Exptl. Path.* **9**, 198–206(1928).—The specific substance from staphylococci is liberated in an active antigenic state. Complete loss of activity follows unless the free specific antigen is protected from the action of living cocci and their enzymes. This destructive effect is not immediate, so that it is possible to obtain active specific substance from staphylococci undergoing rapid autolysis by methods which ensure prompt sterilization and cessation of further enzyme cleavage. The best results are obtained by extg. staphylococci at a temp. which destroys enzymes. HARRIET F. HOLMES

Diabetes. A statistical study of 2000 cases. HENRY J. JOHN. Cleveland Clinic. *Arch. Internal Med.* **42**, 217–47(1928); cf. *C. A.* **21**, 1845.—"In this series 46.75% cases were in males and 53.25% in females. The relative age incidence from the highest to the lowest according to age decades was: 6, 7, 5, 4, 3, 2, 1. There was a hereditary history of diabetes in 5.3% and a familial history in 4.5%. The highest blood sugar level on admission was 0.908%. Glucosuria was found in many diabetic persons with normal blood sugar, but it was missing in many patients with high blood sugar (highest blood sugar without glucosuria 0.390%). The general belief among the laity that *insulin* once used must always be used is shown to be fallacious. The blood sugar response to insulin varies tremendously. It also varies from day to day in the same case. Insulin reactions are not wholly due to hypoglucemia, but are found fairly frequently in the presence of hyperglucemia (a case with 0.467% glucose). Many normal persons have a blood sugar content as low as 0.03–0.04%. The total no. of patients with diabetic coma in this series was 4.25%. Of the 59 patients treated 11 died. In these cases the blood sugar on admission was 0.2–1.664%, the plasma CO_2 9.9–44.3, the highest figures appearing in patients who had received insulin before they were admitted. The total mortality was 6.55%. The incidence of syphilis was 2.7%." MARY JACOBSEN

The bacteriology of rheumatic fever and the allergic hypothesis. HANS ZINSSER AND H. YU. Harvard University Medical School. *Arch. Internal Med.* **42**, 301–9 (1928).—A report of 4 cases which present evidence in favor of the allergic hypothesis. MARY JACOBSEN

Blood destruction in chronic malaria and other splenomegalies. P. B. VAN STEENIS. *Geneeskund. Tijdschr. Nederland. Indië* **68**, 401–25(1928).—In normal natives (Java?) the feces urobilin (I) is 80 mg., the urine urobilin (II) > 0.4 mg./24 hrs.; serum bilirubin > 0.4 (Hymans v. d. Bergh). Erythrocyte resistance: beginning hemolysis at 0.44–0.50% NaCl, complete hemolysis at 0.32–0.38% NaCl. Vital staining of erythrocytes (Widal-Chauffard) is 1–19%. During the acute malaria attack I increases 20 times, II even more. They fall rapidly with the disappearance of fever and parasites from the blood. In chronic malaria with splenomegaly I is increased about 2.5 times, as a result of splenomegaly even in the absence of fever. II

may often be normal. During a relapse I and II are slightly higher than the av. values in chronic malaria. The blood destruction as a result of a relapse is as a rule insignificant when compared with the const. marked destruction assocd. with splenomegaly. The anemia in chronic malaria is therefore essentially a splenic anemia. In hyperplastic splenomegalies of other origin (syphilis, chronic septicemia with or without malaria) the anemia is of the same nature and goes over into hemolytic icterus. I and II are not increased in non-hyperplastic splenomegalies (idiopathic eosinophilia-polyglobulia). I and II are the most exact measure of blood destruction and regeneration, better than the usual morphological blood detns. The vital stain detns. agree well with I and II and may replace it provided the hemoglobin content remains const.
MARY JACOBSEN

Glucemia in tuberculosis of childhood. A. BARATTA. *Pediatria Rivista* **36**, 807–11 (1928).—In a group of 42 children 2–16 years old the blood sugar was about normal (0.99%) in the initial stages provided the state of nutrition was good. It was 0.74% in pulmonary tuberculosis and 0.77% in scrofula. MARY JACOBSEN

Alkaline reserve in bone and joint tuberculosis especially in relation to ultraviolet treatment. GIUSEPPE JEMMA. *Pediatria Rivista* **36**, 878–82(1928).—In 20 patients 3–14 years old the alk. reserve was lowered (av. 48.2), especially in pronounced toxic conditions. Irradiation with ultra-violet light improved the general conditions and restored the normal alk. reserve. MARY JACOBSEN

Albuminuria of childhood. A. MAZZEO. *Pediatria Rivista* **36**, 894–8(1928).—Review. MARY JACOBSEN

Some recent tests of liver function. J. ROUILLARD. *Rev. méd.* **45**, 5–31(1928).—Review. MARY JACOBSEN

The importance of the adrenal cortex for the pathogenesis of experimental scurvy. ELISA MORELLI AND V. M. GRONCHI. *Rev. sud-americana endocrinol. inmunol. quimioterap.* **11**, 437–55(1928)(In Italian).—In exptl. scurvy of guinea pigs and rabbits the adrenal secretion is markedly impaired. The lipoid material disappears almost entirely while the fuchsinophilic granules and siderophilic cells show a considerable increase in no. The acetone exts. which normally contain only traces of a *hemorrhage-producing substance* show a great increase in this poison, which in its action resembles lysocythin. A tendency to capillary hemorrhages in the adrenals has been observed in all diseases in which the latter are directly or indirectly affected: infectious diseases or poisoning with war gas, vesicants, some As compds. and a no. of other poisons. M. believes that with the onset of adrenal dysfunction the normally inhibited production of the capillary poison is unleashed. MARY JACOBSEN

Dietetic and allergic factors in infantile eczema. LEON H. DEMBO. *Am. Med.* **34**, 357–60(1928). FRANCES KRASNOW

Practical experiences with malaria prophylaxis in Monrovia (Liberia). W. O. WEHRLE. *Arch. Schiff-Tropen Hyg.* 32, 194–7(1928).—Discussion. F. K.

Neutral red test for gastric function. ST. KARTAL. *Arch. Verdauungs-Krankh.* **42**, 189–97(1928).—After an Ehrmann test meal, the HCl secretion is detd. at $^1/_4$-hr. and $^1/_2$-hr. intervals for $3^1/_2$ hrs. Then 5 cc. of a 1% soln. of neutral red is injected intramuscularly and the gastric secretion tested in the same way. In about 70% of the cases neutral red secretion parallels the HCl secretion. F. K.

Neutral red test for gastric function. K. GLASSNER AND H. WITTGENSTEIN. *Arch. Verdauungs-Krankh.* **42**, 698–9(1928).—Discussion of Kartal's paper. *Cf.* preceding abstract. FRANCES KRASNOW

Serological reactions of lipoids in the organism. H. SACHS. Inst. für exptl. Krebsforschung in Heidelberg. *Arch. Verdauungs-Krankh.* **42**, 353–61(1928). F. K.

Leanness and insulin. Hyperinsulinism. FERNANDO DA FONSECA. *Arch. Verdauungs-Krankh.* 42, 363–77(1928).—Insulin seems to det. the appearance of the fat-depot either by facilitating transformation of carbohydrate or by influencing the sugar oxidation. FRANCES KRASNOW

Insulin and gastric function. J. H. CASCAO DE ANCIÃES. *Arch. Verdauungs-Krankh.* **42**, 377–82(1928); cf. *C. A.* **22**, 270.—Insulin may be used for the differential diagnosis of function, org. achlorhydria and hypochlorhydria as well as for the treatment of gastric neurosis. FRANCES KRASNOW

The clinical significance of titration and hydrogen-ion determination in fractions of gastric contents. O. WINTERSTEIN. Chirurg. Univ.-Klinik Zurich. *Arch. Verdauungs-Krankh.* 42, 579–604(1928). FRANCES KRASNOW

Gastric diseases during the last 30 years (1897–1927). A critical study. L. KUTTNER. Rudolph Virchow-Krankenhauses zu Berlin. *Arch. Verdauungs-Krankh.* **43**, 1–37(1928). FRANCES KRASNOW

Correlation between the constitution of the organism and the chemical content of gall stones. M. T. Liefschitz. Ukrainer Röntgenologischen und Radiologischen Staats-Instituts zu Charkow. *Arch. Verdauungs-Krankh.* 43, 299–314(1928).—No conclusive results as to correlation are given because there are too few cases. In cholesterol-Ca bilirubinate gall stones, 98% is cholesterol. This occurred 3 times as often in the female as in the male cases studied. Frances Krasnow

Ptyalin observation on the healthy and sick. Eugen Solms. *Arch. Verdauungs-Krankh.* 43, 429–32(1928).—Diastase values vary greatly. Only 1 case of acute pernicious anemia showed a very low diastase content. Frances Krasnow

Some observations on Herxheimer's reaction. C. H. Hasselmann. *J. Philippine Islands Med. Assoc.* 8, 53–5(1928).—No reaction was obtained in 19 cases of untreated secondary syphilis when distd. water, aolan or triphal was administered. However, 10 of these 19 cases developed well marked reactions following arsphenamine treatment. Herxheimer's reaction is interpreted as an intermediate local reaction between the parasite and its metabolic products on the one hand, and the humeral and cellular allergy of the surrounding tissue on the other. Frances Krasnow

The carbon dioxide combining capacity of the plasma in lepra reaction, and the effects of the administration of sodium bicarbonate and other drugs. Elisa Roxas-Pineda, Catalino Nicolas and C. B. Lara. *J. Philippine Islands Med. Assoc.* 8, 207–16(1928).—In 18 cases of uncomplicated leprosy the readings varied from 61 to 69 vol. %. In 44 reaction cases the reading varied from 48 to 69 vol. %. Treatment with either $CaCl_2$ or $NaHCO_3$ or both gave good results. NH_4Cl aggravated the lepra reaction. Frances Krasnow

"Filterable viruses." A review. J. Jackson Clarke. *J. Trop. Med.* 31, 220–1 236–9(1928). Frances Krasnow

Studies in bacterial metabolism. LXXXV. The physiologic action of histamine applied directly to the mucosa of the isolated surviving intestine of the guinea pig. Arthur I. Kendall and Philip L. Varney. Washington Univ., St. Louis. *J. Infectious Diseases* 41, 143–55(1927).—By a specially devised app. the difference in the response of intestinal strips to histamine applied directly to the mucosa and the serosa is shown. In the former the response is slow but progressive, but when applied to the serosa contractions appear abruptly and are rapid. The response to applications to the mucosa can be obtained only with neutral or slightly alk. solns. of histamine, acid solns. being completely or nearly inactive. The intestines from young guinea pigs are in general more responsive than intestines from older animals. The response to applications to the mucosa indicates a slow but definite absorption of histamine from the lumen. Dil. CH_3OH prevents or relaxes contractions induced in isolated surviving intestinal strips, depending on whether it was applied before or after the introduction of histamine. **LXXXVI. Anaphylactic contraction induced through the mucosa of the isolated, surviving intestine of the guinea pig.** *Ibid* 156–63.—By using the technic of the preceding expts. anaphylactic contractions of surviving isolated intestinal strips from sensitized guinea pigs could be demonstrated after applying antigen directly to the mucosa. These contractions were similar to those produced by histamine. They were relaxed or prevented by dil. solns. of CH_3OH and were enhanced by dil. alkalies. Julian H. Lewis

Agglutinin response to certain Brucella abortus bacterins. S. J. Schilling and Wm. L. Bleecker. Agr. Expt. Sta., Fayetteville, Ark. *J. Infectious Diseases* 41, 222–32(1927). Julian H. Lewis

Preparation of Salmonella pullorum antigens for complement-fixation tests. L. D. Bushnell and C. B. Hudson. Kansas Agr. Expt. Sta., Manhattan. *J. Infectious Diseases* 41, 383–7(1927).—A satisfactory antigen for use in complement-fixation tests is made by extg. the centrifuged organisms twice with ether and suspending in salt soln. The turbidity of this prepn. makes it unadapted to some tests. An equally satisfactory antigen is obtained by centrifuging the organisms twice after thorough agitation, the last supernatant fluid being the antigen. Julian H. Lewis

Complement fixation and agglutination tests for Salmonella pullorum infection. L. D. Bushnell and C. B. Hudson. Kansas Agr. Expt. Sta., Manhattan. *J. Infectious Diseases* 41, 388–94(1927).—The antigenic substance obtained by washing *Salmonella pullorum* with salt soln. is thermostable and does not act freely in the presence of the cells. All organisms are not equally rich in it. The complement fixation and agglutination tests have about the same value in testing for carriers of *S. pullorum*. A combination of the 2 tests is more decisive, leaving a small no. of questionable cases. Julian H. Lewis

The reaction of the dog to the continuous intravenous injection of B. coli. Bac-

teriological and chemical studies of the lymph. WM. F. PETERSON, ERNST F. MÜLLER AND WM. BOIKAN. Univ. of Ill., Coll. of Med., Chicago. *J. Infectious Diseases* **41**, 405-6(1927).—With the continuous intravenous injection over a considerable length of time (6-24 hrs.) of a dil. suspension of *B. coli* into the dog it was possible to reproduce the clinical picture of the onset and course of an acute, severe, infectious process. By a chem. analysis of the thoracic lymph during such a procedure the changes within the animal could be interpreted, which consisted for the most part of a splanchnic stimulation. There are, however, to be recognized a latent period; the period of fluctuations, with cellular efforts of restoration of the equil.; the period of max. injury, and the premortal period. Only during the period of max. injury do bacteria pass from the blood stream to the lymph channels. JULIAN H. LEWIS

Action of hemotoxins on oxygenated and reduced blood. I. B. welchii toxin. GUILFORD B. REED, J. H. ORR AND W. A. CAMPBELL. Queen's Univ., Kingston. *J. Infectious Diseases* **41**, 434-8(1927).—The oxidation of *B. welchii* toxin by exposure of toxic filtrates to the air for 24 hrs. resulted in considerable loss of hemotoxic action. The hemolysis of oxygenated red cell suspensions requires a much higher concn. of *B. welchii* toxin than reduced red cell emulsions. This may result from an oxidation-reduction relationship between the toxin and hemoglobin or it may depend upon a difference in the absorption of toxin by oxygenated and reduced blood. J. H. L.

Is the antigenic action of hemoglobin due to globin? LUDVIG HEKTOEN AND KAMIL SCHULHOF. John McCormick Inst. for Infectious Diseases, Chicago. *J. Infectious Diseases* **41**, 476-8(1927).—An antihemoglobin serum had a titer high enough that it gave reactions with a purified globin soln. when dild. high enough to eliminate the reaction of the hemoglobin contained in the globin as an impurity. It is thought probable from this expt. that the antigenic properties of hemoglobin are due to the globin radical rather than to hemoglobin, although the possibility of a 3rd group is not yet excluded. JULIAN H. LEWIS

Tissue hydration and its relation to susceptibility and immunity. J. B. WHERRY. *J. Infectious Diseases* **41**, 177-89(1927).—The local edema produced in infection is deemed to be an adaptive reaction in which the substances required by the bacteria are brought in soln. At the same time opsonins are dild. It is suggested that this hydration of tissues is brought about by amines produced by an interaction between parasite and host. Such interaction occurs when heat-killed bacteria are injected intradermally into human beings. The response varies with the species of bacteria and with the individual. The production of local urticaria, or this followed by immediate congestion, is taken to indicate susceptibility; when the whole process is greatly aggravated the next day the reaction is taken to indicate sensitivity. Antigens so selected and given by the desensitization method yield excellent therapeutic results due to the production of opsonins and of a lessened tendency to tissue hydration. JULIAN H. LEWIS

The Kahn test in experimental syphilis. JOHN E. WALKER. Army Medical School, Washington, D. C. *J. Infectious Diseases* **41**, 233-7(1927).—Only 36% of normal rabbits gave negative reactions as compared with 99.8% in normal human beings. The reaction in rabbits became stronger after inoculation with syphilis usually in direct proportion to the severity of clinical symptoms. The increase in strength was more after intratesticular injection than after scrotal inoculation. With a decrease in size of the lesions the strength of the reaction decreases. The reaction can be made sp. for syphilis in rabbits by subtracting 40 quant. units from the results. JULIAN H. LEWIS

Action of B. welchii toxin and other hemotoxins on erythrocytes in vivo. GUILFORD B. REED, J. H. ORR AND C. MARION SPENCE. Queen's Univ., Kingston, Canada. *J. Infectious Diseases* **41**, 283-8(1927). **Action of B. welchii toxin and other hemotoxins on erythrocytes in vitro.** GUILFORD B. REED AND J. H. ORR. *Ibid* 289-93. JULIAN H. LEWIS

Nonspecific Wassermann and agglutinin reactions with serum from patients with febrile diseases. MARION CORRIGAN. Michael Reese Hospital and Nelson Morris Inst., Chicago. *J. Infectious Diseases* **41**, 457-60(1927).—Wassermann reactions, typhoid agglutination and *B. proteus* X agglutination were observed to occur with serums of patients with high temps., but on so few occasions that a casual relationship of the temp. may be doubted. The temp. on the other hand may be instigative of a latent luetic condition or of the fluctuation of nonsp. agglutinating antibodies. J. H. L.

The proteases and antiproteases of pleural exudates. CHARLES WEISS. College of Physicians and Surgeons, Columbia Univ., New York, and the School of Tropical Medicine, Univ. of Porto Rico, San Juan. *J. Infectious Diseases* **41**, 467-75(1927).—

Proteases and antiproteases are demonstrated and measured in the constituents of pleural exudates, with particular reference to their activity over a range of p_H concn.
JULIAN H. LEWIS

The proteins in egg white and their relationship to the blood proteins of the domestic fowl as determined by the precipitin reaction. LUDVIG HEKTOEN AND ARTHUR G. COLE. John McCormick Inst. for Infectious Diseases and Univ.. of Illinois. *J. Infectious Diseases* **42,** 1-24(1928).—Egg white contains 5 distinct antigens: ovoglobulin, ovomucin, crystallizable ovalbumin, non-crystallizable conalbumin and ovomucoid. Ovalbumin, ovomucin and ovomucoid may be completely freed from the other proteins present in egg white. The prepns. of ovoglobulin used were contaminated with ovomucin and probably with a slight amt. of ovalbumin. Antiserums against ovalbumin, ovoglobulin, ovomucin and ovomucoid give no reactions when tested with solns. of fibrinogen, euglobulin or albumin prepd. from the blood plasma of the fowl. An antiserum against the whole egg white reacts with the blood albumin and gives no reaction with the other blood proteins. It was shown, by fractionating the albumin in egg white, that this reaction is due to the presence in egg white of the non-crystallizable conalbumin. The conalbumin and the blood albumin are therefore immunologically, and probably chemically, identical. It was not possible completely to sep. conalbumin from ovalbumin and ovomucoid. Since, however, an immune serum against blood albumin contains a sp. precipitin for conalbumin, such a serum may be used to test for conalbumin in the various protein fractions of egg white.
JULIAN H. LEWIS

The specific precipitin reaction of the muscle hemoglobin of the dog. LUDVIG HEKTOEN, F. S ROBSCHEIT-ROBBINS AND G. H. WHIPPLE. John McCormick Inst. for Infectious Diseases, Chicago and the University of Rochester School of Medicine and Dentistry, N. Y. *J. Infectious Diseases* **42,** 31-4(1928); cf. *C. A.* **21,** 3674.—Muscle hemoglobin practically free from blood hemoglobin obtained from dogs gives a sp precipitin which differentiates it sharply from the hemoglobin of dog blood. Muscle hemoglobin introduced intravenously into dogs has about $^1/_5$ of the threshold of renal excretion which blood hemoglobin has and can be utilized only in small quantities to form red blood cells.
JULIAN H. LEWIS

Skin reactions with bacterial filtrates of anhemolytic streptococcus, hemolytic streptococcus and B. typhosus. KATHERINE M. HOWELL AND MARION CORRIGAN. Michael Reese Hospital and Nelson Morris Inst. for Medical Research, Chicago. *J. Infectious Diseases* **42,** 149-60(1928).
JULIAN H. LEWIS

Serum therapy of botulism in monkeys. GAIL M. DACK AND WILLARD L. WOOD. Univ. of Chicago. *J. Infectious Diseases* 42, 209-12(1928).—*Macacus rhesus* monkeys were found susceptible to the oral administration of small amts. of type A botulinus toxin. About 2000 m. l. d. (intraperitoneal) for mice was found lethal when fed to monkeys weighing approx. 2.5-4.0 kg. The administration of antitoxin after the appearance of symptoms of botulism failed to prevent death. Likewise no beneficial effects were shown when barbital was given simultaneously. The time of appearance of symptoms and death varied according to the amt. of toxin fed. Where small doses were given the time of appearance of symptoms was very much delayed and the symptoms persisted over a long time. Toxin was demonstrated in the blood of 6 out of 9 monkeys after the appearance of symptoms of botulism. No toxin was found in the blood of those monkeys which developed symptoms later than 24 hrs. after they were fed toxin. The results obtained by feeding botulism toxin to monkeys are similar to the results that have been reported for botulism in human beings.
J. H. L.

Serum reactions produced by feeding antigens. L. P. DOYLE. Univ. of Chicago and Agricultural Experiment Station, Purdue Univ., LaFayette, Ind. *J. Infectious Diseases* **42,** 218-25(1928).—Small quantities of antibody in the serum of rabbits fed with certain antigens can be detected better by the agglutinin than by precipitin or complement-fixation tests. In rabbits fed with living cultures of *B. aertrycke* and *B. enteritidis*, sp. agglutinins appeared promptly in the blood. When the cultures were killed in various ways and then fed to rabbits, agglutinins usually did not appear in the blood, although the killed cultures were shown to have agglutinogenic properties when injected subcutaneously. CHOH-killed cultures of *B. suipestifer* fed to young pigs produced well-defined symptoms of gastric irritation and gave rise to well-marked formation of agglutinin.
JULIAN H. LEWIS

Rapid macroscopic agglutination for the serum diagnosis of Bang's abortion disease. I. FOREST HUDDLESON AND ELIZABETH ABELL. Mich. State College, East Lansing. *J. Infectious Diseases* **42,** 242-7(1928).
JULIAN H. LEWIS

The protective substance in antipneumococcus serum. I. A separation of phos-

phorus and some inert protein from the water-insoluble precipitate of antipneumococcus serum. LLOYD D. FELTON. Harvard Medical School, Boston. *J. Infectious Diseases* **42,** 248–55(1928).—The antiserum is first pptd. with distd. H_2O. A soln. of this ppt. is re-pptd. with acid and a neutral salt to get rid of P-contg. inert protein, leaving behind a H_2O-insol. protein which contains the protective substance. While this is the principle of the method the details of its application for the best results remain undetd. JULIAN H. LEWIS

The protective substance in antipneumococcus serum. V. Febrile reaction from intravenous injection. LLOYD D. FELTON. Harvard Medical School, Boston. *J. Infectious Diseases* **42,** 256–62(1928).—The H_2O-insol. ppt. obtained by dilg. antipneumococcus serum with acidulated H_2O is pyrogenic, but when this fraction is freed from a protein contg. most of the P and lipins it no longer has this action on intravenous injection. JULIAN H. LEWIS

The spermatocyte reaction (testicular tuberculin reaction) in the albino rat. JOHN E. BLAIR. Hospital for Joint Diseases, New York. *J. Infectious Diseases* **42,** 435–9(1928).—The sp. allergic response of the testis to tuberculin described by Long (*Am. Review Tuberculosis* **9,** 215(1924)) was confirmed for guinea pigs but could not be obtained in the albino rat infected by intraperitoneal or intratesticular inoculation of human tubercle bacilli. JULIAN H. LEWIS

Search for protective, bacteriophagic and enzymic agents in pneumonic sputums. BERNICE E. EDDY. Univ. of Cincinnati. *J. Infectious Diseases* **42,** 449–60(1928).—There is protection, or a latent period in the time of death, of mice given injections with fatal doses of pneumococci mixed with filtrates of sputum from patients with lobar pneumonia after crisis, as compared with control mice receiving only broth with the dose of pneumococci. Protection or a latent period in the time of death of mice does not occur with filtrates of sputum obtained before crisis, with sputum filtrates from fatal cases, with sputum filtrates after crisis injected with pneumococci of different type from that infecting the patient, nor with the sputum filtrate boiled and injected with homologous pneumococci. A bacteriophage which might account for crisis was not recovered from the sputum. Proteolytic enzymes which would erode Loeffler's blood serum (Lord, *C. A* **13,** 3239; Lord and Nye, *C. A.* **15,** 3325) were demonstrated in the sputum of 2 pneumonia patients. JULIAN H. LEWIS

The nature of diphtheria toxin. ARTHUR LOCKE AND E. R. MAIN. St. Lukes' Hosp., Chicago. *J. Infectious Diseases* **43,** 41–59(1928).—A study of the conditions favoring growth and toxin production in differently prepd. cultures of a toxigenic strain of diphtheria bacillus indicated that toxin is not accumulated unless there is a definite growth momentum, a concomitant growth inhibition, and unless there are present enzyme-buffers like proteoses to protect the toxin from extracellular proteolysis. The toxin principle has been concd. and sepd. from the greater part of the accompanying precipitinogen and nonsp. principles, with acid as the precipitant. Prepns. were obtained with a N equiv. of 0.0006 ± 2 mg. per corrected Lf unit, which give intradermal skin reactions in dilus. approaching 1 part in a billion. These purified prepns. were unmistakably lipoprotein in character and contain no carbohydrate. They have an isoelectric range within that manifested by prepns. of the bacillary substance in which they have their origin and they are, like protoplasm, extremely sensitive to denaturation. The theory of the nature and origin of diphtheria toxin is discussed and the suggestion made that the antigenicity, antitoxin-binding power, and toxicity of bacterial toxins may be manifestations of an identical, more fundamental property—their combining avidity. JULIAN H LEWIS

Changes in blood dextrose in rabbits after intravenous injections of histamine. MAUD L. MENTEN AND HELEN M. KRUGH. Univ. of Pittsburgh. *J. Infectious Diseases* **43,** 117–20(1928).—The convulsions and shock produced by lethal doses of histamine in normal rabbits and rabbits immunized with *B. paratyphosus* and *B. enteritidis* may be accompanied by no appreciable change in the blood dextrose or by a maximal hyperglucemia The authors believe that these expts. indicate that allergy is not a factor in the production of agonal hyperglucemia. JULIAN H. LEWIS

Insulin content of the pancreas following intoxication of rabbits with paratyphoid B filtrate and dysentery bacilli. MAUD L. MENTEN AND HELEN M. KRUGH. Univ. of Pittsburgh. *J. Infectious Diseases* **43,** 121–5(1928).—Single intravenous sublethal injections of paratyphoid B filtrates do not appreciably alter the insulin content of the pancreas as demonstrated by comparative biological assays in test rabbits. The hypoglucemic potency of the insulin ext. of the pancreas from rabbits in which injections of *B. dysenteriae* (Shiga) had caused a prolonged fatal toxemia and hyperglucemia was slightly diminished. JULIAN H. LEWIS

The production of potent antipneumococcus serum in rabbits. B. L. FREEDLANDER. Univ. of California Medical School, San Francisco. *J. Infectious Diseases* **43,** 137–44(1928).—Rabbits were immunized with injections of exts. of infected rabbit tissue rendered sterile by centrifugation and addns. of rivanol. A type 1 antipneumococcus serum affords highest protection, type 2 serum to a lesser degree and type 3 serum gives no protection. By *in vitro* tests these sera show few agglutinins, no precipitins, no remarkable opsonic powers and no direct bactericidal action. Antipneumococcic serum from the rabbit is as effective as antipneumococcic serum from the horse in protecting mice against type 1 infection. JULIAN H. LEWIS

Incidence of cloudy reaction in agglutination tests for Salmonella pullorum infection. G. S. SCHILLING AND S. J. SCHILLING. Univ. of Arkansas, Fayetteville. *J. Infectious Diseases* **43,** 172–80(1928). JULIAN H. LEWIS

Certain constituents of acid-fast bacteria and their antigenic characteristics. I. Communication. A. KNORFF-PETERSON AND W. LIESE. Univ. Kiel. *Z. Immunitäts.* **51,** 87–114(1927).—By a study of the staining reactions of acid-fast bacteria after acid hydrolysis in aq. and alc. media and extn. with hot alc. it is shown that although tubercle bacilli have the same chem. structure as other acid-fast bacteria they are more stable. The Gram stain and acid fastness depend on different constituents, those responsible for the Gram stain probably being lipoproteins. Ext. of acid-fast bacteria with simple fat solvents, leaving the bacteria Gram-positive and acid fast, gives exts. which react as antigens in complement-fixation tests. They do not, however, react specifically with sera of tuberculosis patients. Exts. obtained with hot alc. after treating tubercle bacilli with acid, leaving the bacteria Gram negative and non-acid fast, do react specifically in tuberculosis. Such exts. from saphrophytic bacteria do not react in this way. JULIAN H. LEWIS

The biochemistry of antigens. F. PRZESMYCKI. Staatlichen Hyg. Inst., Warschau. *Z. Immunitats.* **51,** 408–20(1927).—From *Proteus* X_{19} *H* and typhoid bacteria a protein-free substance was isolated by the technic of Zinsser (*C. A.* **17,** 1072) which reacted strongly sp. with antibodies obtained by immunizing with whole bacteria Immunization with this substance together with hog serum produces no antibodies against itself. Bacterial lipoids with hog serum produce strong complement fixing antisera which react with lipoids from most bacteria and are therefore not species sp. Lipoids alone produce antibodies but in much lower titer. Immune sera produced by injecting whole bacteria react specifically with bacterial lipoids. It seems that bacteria in their entirety produce more sp. antibodies than their isolated constituents. JULIAN H. LEWIS

Skin injection and skin immunity in anthrax. TH. BAUTZ AND CH. AMIRASLANOV. Bacteriologischen Staatsinstitut, Baku. *Z. Immunitats.* **56,** 1–6(1928).—The findings of Besredka that cutaneous vaccination against anthrax is superior to subcutaneous vaccination are confirmed. However, contradictory to Besredka, there is no selective sensitivity of the skin to anthrax. On the other hand, the better results obtained with cutaneous vaccination are thought to be due to the ability to administer large enough amts. of organisms to produce antibodies yet without killing, which cannot be done by subcutaneous injections. JULIAN H. LEWIS

The speed of flocculation of antidiphtheria serum. K. CHALAPINA. Bakteriologischen Staatsinstitut, Baku. *Z. Immunitäts.* **56,** 7–10(1928).—Antidiphtheria sera, which differed from each other only in the speed with which flocculation occurred, when mixed with toxin, differed in their therapeutic action. The quicker flocculation occurred, the better the therapeutic results. These findings are different from those of Madsen and Schmidt (*Ann. inst. Pasteur* **40,** 300–2(1926)). JULIAN H. LEWIS

Formation of anatoxin. D. KISSIN AND L. BRONSTEIN. Staatlichen Centralen Bakteriol. Inst., Moskau. *Z. Immunitäts.* **56,** 11–23(1928).—On addn. of acid to toxin to a certain p_H a ppt. is formed which contains the toxic and flocculation properties of the original toxin. When the acid is added stepwise, 3 characteristic points are observed: (1) when the p_H reaches 6.2–6.3; (2) point of max. pptn.; (3) the appearance of free HCl. The relation of the 1st point to the 2nd is a const. 1:2 for fresh diphtheria toxin and 1:1 for its anatoxin, 1:1 for fresh tetanus toxin and 1:0.05 for its anatoxin. The change in the quotient when anatoxin is produced can be used as an indicator of the complete ripening of the anatoxin. A theory based on a hypothetical chem. formula for toxin is given to explain these effects of acid.

JULIAN H. LEWIS

Studies in anthrax infection. H. HRUŠKA. Staatlichen diagnost. und Serotherapeutischen vet. Inst., Ivanovice n. H. Tschechoslowakei. *Z. Immunitäts.* **56,** 49–59 (1928).—A formolized pulp of anthrax bacilli loses its ability to immunize guinea pigs

when given intracutaneously. Anthrax vaccine kept 2 yrs. in sealed ampoules lost its virulence and its ability to immunize guinea pigs even in very large doses. Formolized anthrax cultures and vaccines kept in sealed ampoules do not produce an active immunizing endotoxin. Formolized aggressins from the blood and spleen of a cow dead with anthrax vaccinated guinea pigs. This property of the aggressins decreased on diln. with NaCl. The aggressins are formol-stable and in the formolized state can be used a long time as a vaccine. Aggressins are reaction products of animals dead with anthrax. When injected subcutaneously into hyperimmune horses they produce a marked local edema. JULIAN H. LEWIS

Specific and subspecific antibodies. WL. MARKOFF. Inst. fur Baketeriologie und Serologie, Univ. Sofia. *Z. Immunitäts.* **56**, 95–106(1928).—Bacteriophage acting on bacteria progressively change their antigenic properties. Whole bacteria produce true antibodies while partially digested ones give rise to antibodies variously referred to as "subantibodies," "nebenantikörper," and "partial agglutinins." J. H. L.

Group specific antigens and antibodies. GREGOR GREENFIELD. Krankenhaus, Friedrichshain. *Z. Immunitäts.* **56**, 107–29(1928).—Several human sera were found which gave positive complement-fixation reactions sp. for group A. The reaction occurred not only with fresh red cells but also with alc. exts. The reactions with the alc. exts. were usually stronger. Specificity was proved not only with direct tests but also with absorption expts. Saliva gave strong group sp. tests. Group sp. flocculation tests were not obtained with the complement fixing sera and alc. exts. of red cells. Immunization of rabbits with group *A* red cells produced group and specie sp. antibodies. Beef serum absorbed with red cells of group *AB* was still active against group *O* red cells. The anti-O agglutinin in beef serum was usually stable for a long time although many sera lost their activity in a few days. The agglutinin was equally active at room temp. and at 0°. Anti-O agglutinin bound to red cells of group *O*, *A* or *B* can be readily recovered. Heart muscle cells of group *O* absorbed anti-O agglutinin stronger than did those of group *AB*. In 2 cases tried the heart muscle of group *A* absorbed anti-O agglutinins stronger than that from group *AB* and weaker than that from group *O*. JULIAN H. LEWIS

The heterologous antigens in human red cells and those of different animals. I. L. KRICHEVSKII AND R. E. MESSIK. Mikrobiol. Forschungsinstitut Volksbildungskommissariats R. S. F. S. R., Moskau. *Z. Immunitats.* **56**, 130–46(1928).—Forssman's antigen is found in red cells of all men independent of the 4 groups to which they may belong. In all 4 groups are also found, beside the Forssman antigen (sheep), the antigen of the hen, turtle, cat and hog. In the red blood cells of the sheep, hen, turtle and cat are found the heterologous antigen of man and the hog. J. H. L.

Specificity of the tuberculin reaction. M. MASTBAUM Bakteriologischen Institut der Universität, Kasan. *Z. Immunitats.* **56**, 147–54(1928).—Healthy guinea pigs sensitized with *B. coli* protein and with hog serum + old tuberculin reacted to tuberculin, but the histological nature and clinical course of these reactions were much different from those of the true tuberculin reaction. JULIAN H. LEWIS

Microbiotic specific precipitin and complement-fixation reactions. R. TORIKATA AND K. FUJIMORI. Univ. Kyoto. *Z. Immunitats.* **56**, 155–74(1928).—Removal of lipoid from antigen (cholera filtrates, native and heated) and anti-cholera serum did not affect the precipitin reaction but completely abolished the complement fixation reaction. Removal of lipoid from antiserum alone affected neither precipitin nor complement fixation reactions. Removal of lipin from antigen alone did not affect the precipitin reaction either quantitatively or qualitatively but did destroy the complement fixation reaction. An anti-cholera serum gave a good Wassermann reaction but did not after the lipoid was removed. In both precipitin and complement fixation reactions boiled antigen showed more avidity for antiserum than did the native form. JULIAN H. LEWIS

Impediment phenomena in complement-fixation reactions with cholera vibrios. K. FUJIMORI. Univ. Kyoto. *Z. Immunitäts.* **56**, 175–90(1928).—Boiled cholera antigens have a much greater avidity for complement-fixation antibodies than have native antigens. This difference can be measured accurately and expressed mathematically, and is thought to be due to the removal of certain thermolabile inhibitory substances. JULIAN H. LEWIS

The role of lipoids in immunization. Binding and detoxifying properties of lipoids. Lipoid vaccines. VITAL BRAZIL AND J. VELLARD. Staatlichen Serotherapeut. Inst. Butatan, Sao Paulo, Brazil. *Z. Immunitäts.* **56**, 191–209(1928).—Lipoids from normal serum and the liver have the common property of binding and detoxifying bacterial and snake venoms and of decreasing the virulence of bacteria. The similarity of these

lipoids indicates the importance of the liver as a protection against infection and intoxication in the production of lipoids. There are 2 stages in the action of lipoids on toxins, the first where there is a simple combination and fixation and second in which the toxin part is changed into a completely atoxic substance with its immunizing properties intact. Lipoids greatly reduce the virulence of anthrax bacilli. This property of lipoids introduces the possibility of the production of a new type of vaccine.

JULIAN H. LEWIS

The genesis and characteristics of bacterial toxins. M. EISLER. Staatlichen Serotherapeutischen Inst., Wien. *Z. Immunitäts.* **56,** 209-33(1928).—From the evidence obtained it is believed that bacterial toxins are not so much the products of bacterial metabolism as they are actual cell constituents coming from the bacteria as a result of an increased permeability of the cell membrane occurring at death or injury of the bacteria. JULIAN H. LEWIS

The antigenic action of milk. ERICH VON BAEYER. Inst. für exptl. Krebsforschung, Heidelberg. *Z. Immunitats.* **56,** 241-52(1928).—Antisera from rabbits immunized with boiled goat milk reacted stronger with boiled milk than with raw milk. This may be explained by the phenomenon of concurrence of antigens because in raw milk there are several antigens which mutually inhibit each other while in boiled milk the whey proteins are coagulated, leaving casein for the most part intact. On the other hand the difference between the 2 antisera may be only apparent. In titrating boiled milk and raw milk, equal vols. of the latter contain more protein than the former and a point in the series is reached where there is an excess of antigen which may inhibit complement fixation reactions whereas with boiled milk this same diln. may contain optimal concns. of antigen. Antisera against raw goat milk react with raw cow milk only and those against boiled goat's react with boiled cow milk. Anti-milk sera react with alc. exts. of milk. Antisera for boiled goat milk reacted stronger against alc. exts. of human liver, and guinea-pig kidney and liver than did antisera against raw goat milk. No reactions were obtained with either against alc. exts. of rabbit organs. These reactions and the presence of a strong hemolytic amboceptor for sheep red cells indicate the presence of Forssman's antigen in goat milk. JULIAN H. LEWIS

The action of auto-serum on blood vessel preparations. H. HASHIMOTO. Forschungsinstitut fur Hygiene und Immunitätslehre, Berlin-Dahlem. *Z. Immunitäts.* **56,** 253-8(1928).—The blood-vessel-contracting substance (auto-contractin) of normal serum from the same species as the prepn. of blood vessels is not destroyed by heating to 100° for 20 min. Auto-contractin, in contrast to hetero-contractin, has no relation to coagulation time of the blood. Auto-plasma, like hetero-plasma, is not toxic for blood vessels. JULIAN H. LEWIS

The action of homologous organ extracts on isolated blood vessels. H. HASHIMOTO. Forschungsinstitut für Hygiene und Immunitätslehre, Berlin-Dahlem. *Z. Immunitäts.* **56,** 258-65(1928).—Aq. exts. of guinea-pig organs, which are usually fatally toxic for guinea pigs, produce a marked vasoconstriction of guinea-pig blood vessels. In instances where this toxic action was weak a vasodilation was observed.

JULIAN H. LEWIS

The action of bacteria and red cells on the isolated blood vessels of animals sensitized with these substances. H. HASHIMOTO. Forschungsinst. für Hyg. und Immunitätslehre, Berlin-Dahlem. *Z. Immunitats.* **56,** 265-70(1928).—Blood vessel prepns. of rabbits and guinea pigs sensitized with bacteria and foreign red cells showed only a low-grade reaction to these substances. JULIAN H. LEWIS

The action of bacterial anaphylatoxins on the isolated blood vessels of guinea pigs and rats. H. HASHIMOTO. Forschungsinstitut für Hygiene und Immunitätslehre. *Z. Immunitäts.* **56,** 271-5(1928).—Anaphylatoxin prepd. by digesting bacteria with fresh guinea-pig serum produced a vasoconstriction in the isolated blood vessels of normal guinea pigs and, to a less extent, rats. JULIAN H. LEWIS

Lens anaphylaxis with isolated blood vessel preparations. H. HASHIMOTO. Forschungsinstitut für Hygiene und Immunitätslehre, Berlin-Dahlem. *Z. Immunitäts.* **56,** 276-8(1928).—The well-known organ specificity of the lens of the eye was demonstrated in guinea-pigs and rats, isolated blood vessel prepns. being used. J. H. L.

The inhibition of bacterial growth in human serum. L. K. WOLFF. Univ. Amsterdam. *Z. Immunitäts.* **56,** 279-87(1928). See *C. A.* **22,** 625. JULIAN H. LEWIS

The influence of cholesterol on experimental anaphylaxis. L. SURÁNYI AND L. JARNO. Pázmány-Péter Univ., Budapest. *Z. Immunitäts.* **56,** 303-7(1928). See *C. A.* **22,** 1190. JULIAN H. LEWIS

Chemical and serological experiments with various fractions of blood serum. R. KIMURA. Univ. Kyoto. *Z. Immunitäts.* **56,** 330-46(1928).—From the ether ext. of

beef erythrocytes 2 phosphatides were obtained and 1 from the alc. ext. The relation of P to N in the former was 1:2 and in the latter 1:2.5. Injected into rabbits these phosphatides produced no hemolysis for beef-red cells. By fractional pptn. with $(NH_4)_2SO_4$ 4 globulins and 1 albumin were obtained from beef serum. The S content of albumin was much higher than that of the globulins, and the easily salted out globulins contained more S than those salted out less easily. Lysin N is also higher in albumin than in the globulins. Monoamino acid N is higher in the less sol. globulins than in those more sol. There was no noticeable difference in the C, H_2O and total amide and humin N of the various protein fractions of serum. Between globulin and albumin there are marked serological differences and between 2 globulins most widely sepd. chemically. JULIAN H. LEWIS

Studies on the so-called antivirus of Bersedka. H. DOLD AND H. R. MÜLLER. Reichsgesundheitamts, Berlin. *Z. Immunitäts.* **56**, 347–74(1928).—Sterile filtrates from bouillon inoculated several times with bacteria, the so-called antivirus of Besredka, showed on renewed inoculation an inhibition of growth. Any effect of antivirus on infection, local or general, favorable or unfavorable, can be duplicated with plain bouillon or salt soln. If any reaction results it is due to a nonsp. local inflammatory reaction. JULIAN H. LEWIS

The bactericidal action of serum against B. typhosus as influenced by unspecific substances. W. PFANNENSTIEL. Westfälische Wilhelms-Universität, Münster. *Z. Immunitäts.* **56**, 389–448(1928).—A study was made of the bactericidal action of serum subjected to many phys. and chem. agents or from animals injected with various types of substances. JULIAN H. LEWIS

The relation of lipoids to proteins and immunity. S BEFANTI. Serotherapeutischen Inst., Milan. *Z. Immunitats.* **56**, 449–63(1928).—A lecture in which it is shown that lecithins from various sources can be split into a toxic substance called lysozithin through the action of a lecithinase found in different animal tissues and fluids. Lysozithin differs chemically from lecithin in the loss of an unsatd. fatty acid mol. It combines with proteins to form a nontoxic compd. These facts are of significance in understanding the role of lipoids in immunity. JULIAN H. LEWIS

The serology of lipoids from carcinoma. HERMANN LEHMANN-FACIUS. Städtischen Krankenanstalt, Mannheim. *Z. Immunitats.* **56**, 464–515(1928).—Alc. exts from human carcinoma contain the heterophilic sheep red-cell antigen. Immunization with these lipoids produces not only the heterophilic amboceptor but also tissue sp. antibodies. JULIAN H. LEWIS

The influence of microörganisms on hemagglutination. MARIO PRATI. Univ. Modena. *Z. Immunitats* **57**, 1–18(1928).—Red blood cells kept exposed to the air for several days show a tendency to clump, an appearance which at times cannot be distinguished from true isoagglutination The exclusion of evaporation as a cause led to the study of bacterial infection as a factor. A large number of bacteria inoculated into a suspension of unagglutinable cells led to this pseudoagglutination. The effect is obtained only after a period in which there is growth of the organisms, and is due to changes in the serum as it takes place only when the red cells are suspended in serum. The low titer of the active substance, the inhibiting effect of lecithin and the impossibility to absorb it from the serum with red cells distinguished it from true agglutinin. This phenomenon is closely associated with the increased sedimenting rate observed in acute infections. Although serum infection lowers the titer of true isoagglutinins the specificity remains unchanged. JULIAN H. LEWIS

The fraction and specificity of serum protein fractions obtained by electroösmosis. R. OTTO AND K. IVANOV. Inst. "Robert Koch," Berlin. *Z. Immunitats.* **57**, 19–41 (1928).—In general there is, with active anaphylaxis expts., a specificity of the globulin and albumin fractions. Between euglobulin and pseudoglobulin a differentiation was not always possible, and less so between sol. and insol. albumin. Active sensitization with the albumin fraction was uncertain even at various incubation periods. With passive anaphylaxis antisera to all fractions showed a species specificity. Serum against euglobulin showed a globulin specificity which permitted a certain separation between pseudoglobulin and euglobulin as the former did not show this specificity. Anti-albumin serum was not specific for albumin. In precipitation expts. anti-euglobulin serum was species and globulin specific. The anti-pseudoglobulin serum reacted to a certain degree with both albumin and euglobulin. One of 2 such sera also reacted with beef serum. The anti-albumin serum reacted more or less species specific but unspecific as to fraction. JULIAN H. LEWIS

Lipoids as complete antigens. KURT MEYER. Rudolf Virchow-Krankenhaus, Berlin. *Z. Immunitäts.* **57**, 42–9(1928).—Lipoid isolated from tapeworms and free

of protein and bacterial infection could act as a complete antigen. In this relation there seemed to be no fundamental difference between the lipoid and protein. The degree of specificity appeared less with lipoid than with protein. J. H. L.

Influence of physico-chemical processes on antibody formation. LEO TAMARI. Inst. "August von Wassermann," Berlin-Charlottenberg. *Z. Immunitäts.* **57**, 85–92 (1928).—An alc. soln. of lecithin and cholesterol suspended in H_2O becomes an active antigen if bivalent cations are added nearly to the isoelectric point. The action of serum in completing the antigenic action of lipoids apparently depends on the ability of the serum to envelop the lipoid particles and thus mask their high electronegative charge. The activity of such protein-lipoid mixts. is made to disappear if the serum-lipoid particles are made electronegative by adding OH ions, and is increased by adding H ions and probably other positive ions. JULIAN H. LEWIS

The relation between the serological reactions of Bordet-Wassermann and Bruck for syphilis. I. L. KRICHEVSKII AND A. J. NEWLER. Mikrobiol. Staatsinst., Rostow a. D. *Z. Immunitäts.* **57**, 93–102(1928).—In order to det. if the antibodies responsible for these 2 types of reactions are the same a large series of sera was tested with the Wassermann reaction using the antigen of Bruck and with the Bruck reaction using the Wassermann antigen. The close agreement in the results of the 2 tests pointed to the identity of the antibodies concerned. JULIAN H. LEWIS

The dependence of chemotherapy and chemoprophylaxis on the reticulo-endothelial system. P. L. RUBINSTEIN. Mikrobiol. Forschungsinst. des Volksbildungskommissariats R. S. F. S. R., Moskau. *Z. Immunitäts.* **57**, 107–29(1928).—The reticulo-endothelial system determines the grade of therapeutic and prophylactic activity of all chemotherapeutic substances. Blockade of the reticulo-endothelial system has very little effect on the therapeutic activity of chemical compds. and does not add materially to the results obtained after splenectomy. JULIAN H. LEWIS

The technic of testing for blood groups. R. FÖRSTER. Universitäts-Hautklinik, Münster i. W. *Z. Immunitats.* **57**, 130–9(1928).—In order to avoid errors in grouping bloods it is advised that each specimen be tested with sera of both types and with red cells of both types. JULIAN H. LEWIS

The diagnosis of smallpox vaccine by complement fixation tests with cocto-antigen. M. LURIE AND M. VOLKOVICH. Bacteriologischen Staatsinstitut, Baku. *Z. Immunitäts.* **57**, 140–5(1928).—Rabbits infected with smallpox vaccine gave a positive complement fixation reaction with the boiled vaccine. JULIAN H. LEWIS

Antigenic properties of lysozyme. T. KIGASAWA. Deut. Univ., Prag. *Z. Immunitats.* **57**, 146–52(1928).—Lysozyme has no regular place of occurrence in plants and animals. There are certain places, as in human tears and egg white, where it is unusually concd. for which fact there is no explanation. No antilysozyme is formed after immunization of rabbits. JULIAN H. LEWIS

Chemospecific antigens. III. The tendency of lipoids to manifest chemospecific antigenic function. A. KLOPSTOCK AND G. E. SELTER. *Z. Immunitäts.* **57**, 174–84 (1928); cf. *C. A.* **22**, 3450.—Lecithin treated with diazotized atoxyl, alkali and acid does not lose its specificity toward antilecithin serum. It reacts stronger with the antiserum, this change being due to the treatment with alkali and acid and not to the diazotized atoxyl. The atoxyl-treated lecithin shows chemo-specificity in that an antiserum obtained by injecting rabbits with it reacts to atoxyl-lecithin but not to metanilic acid-lecithin. The atoxyl-lecithin combination is formed if the 2 substances are mixed at neutral reaction or at an alkaline reaction and afterward made acid. JULIAN H. LEWIS

Antibody formation in lipoid-fed animals. L. SURÁNYI. Bacteriol. Inst. der Kgl. ungar. Pázmány-Péter Univ., Budapest. *Z. Immunitäts.* **57**, **185(1928)**. See *C. A.* **22**, 3221. JULIAN H. LEWIS

The influence of lipoids on toxin action. L. SURÁNYI AND L. JARNO. Bacteriol. Inst. der Kgl. ungar. Pázmány-Péter Univ., Budapest. *Z. Immunitats.* **57**, 199–204(1928).—Cholesterol protects animals against diphtheria, tetanus and botulinus toxins. Lecithin delays the fatal action of diphtheria toxin but hastens that of tetanus. JULIAN H. LEWIS

The augmentive action of lecithin on complement-fixation reactions. KEHNOSUKE YASUI. Inst. für experimentelle Krebsforschung, Heidelberg. *Z. Immunitäts.* **57**, 205–18(1928).—Lecithin increases the antigenic action of bacterial lipoids as antigens in complement fixation tests (Dienes and Scheff, *J. Immunol.* **13**, 161(1927)). This action depends on the effect on the bacterial lipoids and is not due to any antigenic action of lecithin. The action of lecithin is dependent on the manner of mixing of the components, the best results being obtained by mixing the alc. solns. of bacterial lipoid

and lecithin and dilg. with salt soln. The antigenic action of organ alc. exts., serum and bacterial suspension are not influenced by lecithin. Tubercle bacilli, however, are affected because of their high content in lipoid. The pseudo-antigenic action of morphine is increased with lecithin. This reaction is distinguished from a true antigenic action in that the former does not take place at 0°, while the latter does.
JULIAN H. LEWIS

Thrombocytobarin. I. KRICHEVSKII AND R. CHERIKOVER. Mikrobiol. Forschungsinst. des Volksunterrichtskomissariats R. S. F. S. R., Moskau. *Z. Immunitäts.* **57,** 234–60(1928); cf. *C. A.* **20,** 1460.—Killed spirochetes do not produce thrombocytobarin since they have no antigenic function. Immunization with living organisms regularly produce the antibody. Spirochetes heated to 45–56° can absorb thrombocytobarin but do not exhibit the phenomenon of attracting platelets. This is thought to be due to physico-chem. changes and not to the loss of motion or reproduction. Thrombocytobarin is found in the globulin, particularly the pseudoglobulin fraction of rat blood. The failure of spirochetes to attract platelets in serum obtained by clotting as contrasted with serum obtained by defibrination is due to the smaller amt. of complement and thrombocytobarin in the former. Thrombocytes cannot be substituted with bacteria or positively or negatively charged particles in the so-called "Beladungs" phenomenon, although functionally similar cells of other species can be substituted with help of thrombocytobarin. JULIAN H. LEWIS

Studies on tetanus toxin, ricin and several alkaloids and their detoxification. JOHANN SCHUBERT. Inst. fur exptl. Therapie des allgem. Krankenhauses, Hamburg-Eppemdorf. *Z. Immunitats.* **57,** 261–84(1928).—The effect of numerous substances, including amino acids, alkali, lipoids and bacteria, on these toxic substances are studied No general grouping of results can be given. JULIAN H. LEWIS

Comparative action of digestive enzymes on the intracutaneous reactivity and flocculation action of old tuberculin. S. FICHERA Sanatorium Ferrarotto, Catania *Z. Immunitats.* **57,** 285–6(1928).—After pepsin and trypsin digestion the intracutaneous reactivity of old tuberculin is influenced quicker than is the flocculation action. With gastric juice the difference is less and the intracutaneous reactivity remains unaffected longer than the flocculation reaction. JULIAN H. LEWIS

The relation between the Thomsen phenomenon and cold agglutination. LEONE LATTES AND CARLO CREMA. Konigl. Universitat, Modena *Z Immunitats.* **57,** 287–91(1928). JULIAN H. LEWIS

The relation of chemotherapy and chemoprophylaxis to the reticulo-endothelial system of the rat. A. V. LISGUNOVA. Mikrobiol. Forschungsinst. des Volksbildungskommissariats R. S. F. S. R., Moskau. *Z. Immunitats.* **57,** 292–300(1928).—From a comparison of the therapeutic and prophylactic action of germanin, neoarsphenamine, tryparosan and trypan red in normal and splenectomized rats after infection with trypanosomes it is concluded that the reticulo-endothelial system has no protective action itself but that it activates the chemotherapeutic agents to greater efficiency.
JULIAN H. LEWIS

Irregularities in the Landsteiner blood groups. OLUF THOMSEN. Inst fur allgemeine Pathol. der Universitat, Copenhagen. *Z. Immunitats* **57,** 301–19(1928).—The departures made by various authors from the grouping of red cells as given by Landsteiner is due to the occurrence of defective groups, in which there is an agglutinin missing, and to the failure to recognize the so-called "cold agglutinins." J. H. L.

The specificity of fibrin. HANS J. FUCHS. Inst "August von Wassermann, Berlin. *Z. Immunitäts.* **57,** 320–5(1928).—Fibrin from the plasma of a rabbit immunized with sheep red cells and produced by the action of prothrombin from this immunized animal contains amboceptor and thrombin. If coagulation is induced with prothrombin from a normal rabbit, the fibrin contains no amboceptor but does contain thrombin. Since amboceptor and thrombin are obtained by extn. with 8% salt soln. and not with distd. H_2O it is indicated that the 2 substances are chemically bound and not merely adsorbed. The ppt. obtained from oxalate plasma with K_3PO_4 contains prothrombin and amboceptor, both of which can be freed with CO_2. Thrombin solns. obtained from fibrin contain no complement. JULIAN H. LEWIS

The role of conditional reflexes in immunity. S. METALNIKOV AND V. CHORINE. Inst. Pasteur, Paris. *Z. Immunitäts.* **57,** 326–36(1928).—A bacterial emulsion was injected intraperitoneally into guinea pigs daily for 15–25 days. Each injection was accompanied by some external stimulus such as scratching or applying heat to the skin. After a period of recovery from the injections it was found that an application of the external stimulus without an accompanying injection produced cellular changes in the peritoneal fluid similar to those produced by the bacterial emulsions. The phe-

nomenon of conditional reflex studied by Pavlov in connection with physiological reactions is thus found to be applicable to immune phenomena. J. H. L.

The titration of the antigenic property of diphtheria toxoid with the Ramon flocculation method. E. Hoen and L. Chertkov. Staatlichen Bakteriol. Inst., Odessa. *Z. Immunitäts.* **57**, 337–46(1928).—The point of disappearance of flocculation cannot be taken as the titer of the antigenic action of diphtheria toxin and toxoid as advocated by Ramon, nor is the titer obtained by taking the time of the deposit of flocculi confirmed by *in vivo* tests. The time of the appearance of flocculation depends not only on the characteristics of each toxin and toxoid but also on those of the antiserum used for testing. Although toxins and toxoids with high antigenic strength flocculate in general rapidly there are also those with a low antigenic power which flocculate very rapidly. In contrast to the flocculation method the ring pptn. method gives results of more regularity which agree with the proved antigenic strength. J. H. L.

Observations on the Rickenberg-Brussin reaction in relapsing fever of man. V. M. Aristovskii and E. P. Schaechter. Staatlichen Univ., Kasan. *Z. Immunitäts.* **57**, 347–56(1928).—The artificial infection of patients with a culture of *sp. obermeieri* stimulates the formation of the substances responsible for the Rickenberg-Brussin reaction The plasma or the serum from spontaneous coagulation of blood taken the next day after the fall of temp. can be used for the test. As a source of platelets, which in positive reactions clump around the spirochetes, plasma from another species must be used as those of human plasma are not adapted to the reaction. A series of observations lead to the conclusion that the antibody responsible for this reaction and lysin for spirochetes are identical substances Julian H Lewis

Experimental-morphologic studies on the role of the lungs, liver and spleen in fat and lipoid metabolism. C. L. Derman and Samuel Leites *Virchow's Arch. path. Anat.* **268**, 440–55(1928).—After enteral and parenteral introduction of oleic acid in dogs• fatty acids can be found in the lungs, liver and spleen, mixed with neutral fat and lipoids On feeding olive oil, neutral fat becomes visible, particularly in the alveolar epithelium of the lung, the hepatic and Kupffer cells and the reticulo-endothelium of the spleen. In the liver and spleen fatty acids are also found. They may be found in the lungs likewise if previously the spleen has been removed or the reticulo-endothelial system blockaded. After feeding cholesterol in olive oil, cholesterol and its esters are found in the lungs, liver and spleen. After parenteral introduction of this mixt., cholesterol is not found in the lungs and liver, which show the presence only of a mixt. of neutral fat and fatty acids. After feeding lecithin and injecting it, it cannot be found as such in the lungs, liver or spleen; histochemically only its split products, neutral fat and fatty acids, can be discovered. The capacity of the lungs, liver and spleen to split fats and lipoids, thus shown, indicates their importance in lipoid metabolism. E. R. Long

Factors in the calcification of animal tissues. Hans Kleinmann. Univ. Berlin. *Virchow's Arch. path. Anat.* **268**, 686–750(1928) —Tissue calcification may be classified in 3 groups: (1) that dependent on disturbance in Ca metabolism, such as variation in the Ca and PO_4 ions in the tissue fluids; (2) that dependent on depression of cellular activity or complete tissue death; and (3) that resulting from a hypothetical special cell activity, seen only in bone growth. In the first group particular substances occasion the deposition of Ca salts; or, conversely, the disappearance of substances normally preventing the deposition may permit its occurrence. The existence of the second group depends on the fact that a reduction of the normal CO_2 production may lead to a deposition of Ca in tissues through reduction in acidity. It is still problematical why Ca tends to be deposited in greater part as phosphate and lesser as carbonate. K.'s expts. indicate that the important factor is a local increase of Ca and PO_4 in the calcifying tissues to a point where the limit of solubility of the product is exceeded. Decrease in the acidity of the tissue in acid-excreting organs may add to the effect of this factor. To a certain extent the pptd. phosphate is replaced by the carbonate of the tissue juices. It is immaterial for calcification whether the local increase in Ca and PO_4 is due to increased local intake or decreased outgo. •

E. R. Long

General hemochromatosis. Kurt Bork. *Virchow's Arch. path. Anat.* **269**, 178–208(1928).—The hemosiderosis of general hemochromatosis is not due to increased blood destruction, but is rather the result of an impaired prepn. and storage as well as a decreased excretion of Fe. The disturbance in Fe metabolism and associated disturbance of protein metabolism are the expression of a toxic cell injury. The deposited Fe pigment is of itself injurious, but the lesions of hemochromatosis are in part due to the associated toxic substances. There are border-line cases closely allied

to hemochromatosis and occasionally pernicious anemia and leucemia are associated with the abnormality. E. R. LONG

Parenteral denaturization of foreign proteins. I. Effect on sensitizing power. W. H. MANWARING, H. D. MARINO AND J. L. AZEVEDO. Stanford Univ. *J. Immunol.* 15, 109-13(1928); cf. *C. A.* 22, 1389.—Titrations by means of rabbit precipitin indicate that horse proteins injected intravenously into normal dogs are retained in the circulation at least 10 days, but transfusions from these dogs into normal recipients show that these proteins are so altered by the seventh day as almost completely to lose their sensitizing power. Parenteral sensitization may be an initial stage in antibody formation. **II. Denaturization rate in immune dogs.** W. H. MANWARING, H. D. MARINO, J. L. AZEVEDO AND H. C. TORBERT. *Ibid* 351-4.—The rate of parenteral denaturization of horse proteins in horse serum-immune dogs is distinctly slower than in normal dogs. There is not the rapid denaturization previously observed in hypersensitive dogs. This finding supports the view that the sp. antibodies in hypersensitive and immune dogs are not identical. E. R. LONG

Carbon dioxide studies. II. The preservation of alexin in various gaseous environments with special reference to carbon dioxide. GEORGE VALLEY AND JAMES G. MCALPINE. *J. Immunol.* 15, 313-24(1928).—Of several gases employed, including N_2, CO_2, H_2 and air, CO_2 alone exerted a pronounced preservative action on serum alexin. When enclosed in a CO_2 atm. in an air-tight container, alexin may be preserved for 3-5 weeks without loss of potency, and possibly for months. A simple downward displacement of atm. air by a stream of CO_2 is all that is required in making the preservation. **III. Preservation of alexin in carbon dioxide: the nature of the alexin preservation.** GEORGE VALLEY. Yale Univ. *Ibid* 325-34.—The preservative action of CO_2 gas on alexin is in all probability due to the establishment and maintenance of conditions which favor reduction and prevent oxidation. $Na_2S_2O_4$ reactivates alexin which has undergone spontaneous deterioration. "Deoxygenation" effected by several hours' contact with CO_2 gas accomplishes the same result.
E. R. LONG

Effect of exposure to low temperature on diphtheria toxin-antitoxin mixtures. ELLIOTT S. ROBINSON AND BENJAMIN WHITE. *J. Immunol.* 15, 381-94(1928).—There is no satisfactory explanation at present for the increase in toxicity of samples of toxin-antitoxin mixts. after freezing. There is enough evidence to indicate that the phenomenon does occur. Among the contributing factors are (*a*) the persistence of low temps., (*b*) during more than a min. period, (*c*) acting upon toxin-antitoxin mixts. of certain concns., (*d*) contg. phenol or tricresol and certain factors still undetd. The phenomenon appears to be due to a dissocn. of toxin and antitoxin, rather than a destruction of the antitoxin. E. R. LONG

A study of antibodies in their relation to globulins in the cerebrospinal fluid. ALFRED FLAUM. Inst. Path. Lund. *Acta Path. et Microbiol. Scand.* 5, 16-24(1928).—Pandy's reaction was frequently negative in rabbit spinal fluids contg. antibodies produced by exptl. local immunization. This proves that antibodies can exist independently of globulins, at least in spinal fluid. E. R. LONG

The identity of the precipitinogenic and antitoxin-binding substance in diphtheria toxin. E. HOEN, L. CHERTKOV AND V. ZIPP. *Z. Hyg. Infektionskrankh.* 108, 61-5(1927).—Physical and chem. methods failed to detect a difference between the toxic and precipitinogenic substances in diphtheria toxin. A range of H ion concn. borne by the one was equally well tolerated by the other. E. R. LONG

Composition of bone. II. Pathological calcification. M. J. SHEAR AND BENJAMIN KRAMER. Jewish Hosp., Brooklyn, N. Y. *J. Biol. Chem.* 79, 121-3(1928).—Seven specimens of pathol. calcified tissues (thyroid, tuberculous lymph nodes, cusp of aortic valve, capsule of spleen, lung lymph node, mesenteric lymph node and a chalk deposit in a fibroid) all gave normal values (1.88 to 2.01) for the ratio residual Ca:P when analyzed by the new micro-technic. Abnormal values of 2.23 and 2.18 were obtained in analyses of calcified fibroids of the human uterus. A. P. L.

The effect of parathyroid extract on mineral metabolism in infantile tetany. ALFRED T. SHOHL, A. M. WAKEMAN AND E. Y. SHORR. Yale Univ. *Am. J. Diseases Children* 35, 392-7(1928).—Infantile tetany appears to be characterized by an abnormal K metabolism. Na and K are excreted in normal amts. during the administration of parathyroid ext. in tetany, but when the treatment is discontinued, an excess of Na is excreted and K is retained. This is not in accordance with Greenwald's Na theory (*C. A.* 17, 137).
E. R. MAIN

The volume of the blood. II. The volume of the blood and concentration of electrolytes in dehydration and edema. DAN C. DARROW AND THOMAS E. BUCKMAN.

Am. J. Diseases Children **36**, 248–67(1928).—The diminution in the vol. of blood plasma of infants, which occurs both in dehydration and in edema, is not due simply to a transfer of water from the blood. The concn. of blood crystalloids and electrolytes is only slightly affected by changes in the plasma vol. Variations in the concn. of serum proteins and in the vol. of red corpuscles are not necessarily paralleled by changes in the plasma vol. E. R. MAIN

Blood fat in diabetic children. GLADYS L. BOYD. Univ. of Toronto. *Am. J. Diseases Children* **36**, 298–309(1928).—The fat content of the blood plasma is usually above the normal in diabetic children and reaches values of 1000 mg. or more per 100 cc. of blood during acidosis and ketosis, and of 2000 mg. per 100 cc. during coma. A rapid increase in the fat content of the blood may indicate the existence of an incomplete fat combustion and of incipient acidosis. There is no const relationship between the concn. of blood fat and that of blood sugar, but an increase in tolerance to sugar is usually assocd. with a tendency toward a maintenance of the concn. of blood fat at a normal level or with a reduction of an abnormally high fat concn. The concn. of blood fat may be increased by a diet sufficiently high in caloric value to produce overweight. There appears to be no correlation between the fat content of blood and its turbidity. E. R. MAIN

The physiology of the surviving mammalian heart. IV. The consumption of sugar by the heart of diabetic (depancreatized) cats, and the influence of insulin on the sugar consumption of such hearts. ZOLTÁN ASZÓDI. *Biochem. Z.* **192**, 14–25 (1928).—Hearts from depancreatized cats use measurable amts. of sugar though much less than those from normal animals. A single insulin dose increases the heart's sugar consumption to the normal level. This is also true of hearts from normal cats receiving a single insulin dose, and their sugar consumption is raised. S. MORGULIS

The causes of rapid death of diabetic (depancreatized) cats. ZOLTÁN ASZÓDI. *Biochem. Z.* **192**, 26–35(1928).—High blood urea values are found alongside with high sugar values. The administration of insulin which greatly reduces the hyperglucemia has practically no effect on the blood urea level. This explains why diabetic coma without acidosis ends fatally in spite of the beneficial effect of the insulin. S. M.

Chemical composition of the blood in lipemia following hermorrhage. ELLA H. FISHBERG AND ARTHUR M. FISHBERG. *Biochem. Z.* **195**, 20–7(1928).—Removal of 35 cc. blood daily produces lipemia in rabbits. The increase in fat and cholesterol in the blood results from the loss of serum protein, especially albumin. The diminution in serum protein calls forth a compensatory mobilization of body fat in the effort to maintain the normal level of colloidal osmotic pressure. S. MORGULIS

The role of fat in the human organism (in starvation and in tuberculosis). V. H. STEFKO. Inst. für Tuberkuloseforschung, Moskau. *Biochem. Z.* **195**, 396–402(1928).—A diminution in I no. of the subcutaneous and deeper fat tissue has been noted in starved and tuberculous individuals. S. MORGULIS

Chemistry of fattening of liver. A. GUBSER. Inst. für Hochgebirgsphysiologie und Tuberkuloseforschung, Davos. *Biochem. Z.* **198**, 65–80(1928).—Fattening of the liver due to either reduced pressure or to P poisoning is marked by a high phosphatide content, whereas in fattening due to overheating or to $CHCl_3$ poisoning the phosphatide content is not above normal. Fatty degeneration, therefore, does not represent chemically a simple process. In the phosphatide-rich liver the total P does not exceed normal values, the phosphatide P being in greater proportion. The phosphatide must therefore be formed from substances present in the liver itself, probably through a transformation of nuclein P into phosphatide P. S. MORGULIS

The pathogenesis and treatment of dyspnea in the light of recent experiments. C. S. DANZER. Columbia Univ. *Ann. Internal Med.* **2**, 239–47(1928).—If an animal is placed in an atm. contg. 10% of CO_2, it will develop an increased blood velocity followed by cardiac hypertrophy. The animal will live indefinitely because the buffering mechanism neutralizes the excess CO_2 taken up by the blood. If the animal is given a staphylococcus or a streptococcus infection, it will be killed by such exposure to CO_2 in 30 min. with signs of acidosis. Apparently infection impairs the buffer mechanism. This may explain dyspnea on exertion without apparent heart disease, by postulating that the buffer mechanism is impaired. In many instances, therefore, alkalies may relieve the heart. JOHN T. MYERS

The influence of the tropics on rickets. ROGER BROOKE. U. S. A. Fort Sam Houston. *Ann. Internal Med.* **2**, 281–8(1928).—About 25% of children in the tropics have mild rickets. A diet poor in sterols is a minor factor. Long wet seasons with high humidity is important. JOHN T. MYERS

Studies in intestinal obstruction. IV. Strangulation obstruction: a comparison

of the toxicity of the intestine and other tissues autolyzed in vitro and in vivo. OWEN H. WANGENSTEEN AND GEORGE W. WALDRON. Univ. of Minn. *Arch. Surg.* **17**, 430–9(1928); cf. *C. A.* **22**, 3217.—The products of disintegration of intestine were markedly toxic when segments of small intestine were allowed to autolyze in the peritoneal cavity or when rats were given intraperitoneal injections of the products of autolysis of intestine from sterile containers kept in the incubator. When various tissues were allowed to autolyze in the peritoneal cavity, there was a marked increase in the urinary excretion of N, but only a slight increase of the non-protein N of the blood. The low values for blood chlorides seen in dogs with obstruction of the upper part of the intestine were not obtained in strangulation of the intestine alone (closed loop obstruction with gangrene), when the continuity of the remainder of the intestinal tract was restored. The subcutaneous administration of saline to animals with disintegrating segments of intestine appeared to be valueless. JOHN T. MYERS

Antigen structure and immunizing power. SACHS. *Centr. Bakt. Parasitenk. I Abt. Orig.* **104**, 128–40(1927).—The chem. structure of an antigen is the decisive factor in its sp. immunizing power. JOHN T. MYERS

Discussions of active immunity. The action of complex antigens. A. KLOPSTOCK AND G. E. SELTER. *Centr. Bakt. Parasitenk. I Abt. Orig.* **104**, 140–3(1927).—Mixts. of atoxyl and lecithin could bind complement in the presence of serum immune either to lecithin or to ox serum which had been treated with atoxyl. Serum components treated separately with atoxyl produced chemo-sp. antibodies, not only for complement fixation but for anaphylaxis. This is important in the study of the biochemistry of antigens and of idiosyncrasies. JOHN T. MYERS

Cholera toxin and antitoxin. HAHN AND HIRSH. *Centr. Bakt. Parasitenk. I Abt. Orig.* **104**, 211–2(1927).—The cholera vibrio produces a sol toxin in 8-hour cultures which increases in concn. up to 3 days. By the immunization of horses a practical therapeutic antitoxin can be produced. JOHN T. MYERS

Experimental studies in bacterial hemolysins. W. KOLLATH AND GERT TAUBMANN. *Centr. Bakt. Parasitenk. I Abt. Orig.* **104**, 252–6(1927).—There is a parallelism between the formation of a turbid zone around colonies on ascites agar and hemolysis on blood agar plates. This zone on ascites agar no longer stained with Sudan III, as did the remainder of the plate; hence the organism must produce a lipase. This same lipase may destroy the lipoids in the membrane of the erythrocyte, thus causing hemolysis. JOHN T. MYERS

Sensitizing properties of toxoid (anatoxin). BACHER. *Centr. Bakt. Parasitenk. I Abt. Orig.* **104**, 150–2(1927).—Anatoxin will immunize children with very little anaphylactic sensitization; hence large immunizing doses can be given to Schick positive cases. JOHN T. MYERS

Prophylactic immunization against diphtheria with toxoids. KUNDRATITZ. *Centr. Bakt. Parasitenk. I Abt. Orig.* **104**, 152–5(1927).—The toxoids of Ramon are of practical value in diphtheria prophylaxis because they are harmless, and because of the certainty of their immunizing effect. JOHN T. MYERS

The detoxication of endotoxins. LUBINSKI. *Centr. Bakt. Parasitenk. I Abt. Orig.* **104**, 155–7(1927).—The addn. of 0.4% of formalin can decrease the toxic effect of endotoxin without interfering with its immunizing power. This may be due to the hardening effect of HCHO on the bacterial cell which would make absorption slower. This may permit the substitution of a single large dose for the series of injections used for typhoid or cholera inoculations. JOHN T. MYERS

The biological properties of Besredka filtrates. II. The immunizing power of staphylococcus filtrates. G. S. BARG. Bact. Inst., Kiew. *Centr. Bakt. Parasitenk. I Abt. Orig.* **108**, 341–52(1928); cf. *C. A.* **22**, 4144.—Intracutaneous injection of staphylococcus filtrates raises the resistance of guinea pigs to injections of live cultures of staphylococci when given subcutaneously in the same location within about 48 hours. However, the opposite occurs if a large no. of intracutaneous injections of filtrate are given. Intracutaneous injection of sterile bouillon also increases local resistance. Local irritation of the skin, as close shaving, raises local resistance to subcutaneous injections of live staphylococci. JOHN T. MYERS

Hemoglobin resistance. FRIEDA ROSOWSKY. Stadt Krankenhause Berlin-Neukölln. *Folia Haematol.* **36**, 342–51(1928).—By hemoglobin resistance (HR) is meant the no. of sec. required for the disappearance of the oxyhemoglobin line in the spectrum, after the addn. of alkali in the following procedure: Mix 0.1 cc. of a 10 or 20% aq. soln. of blood with 0.1 cc. of 0.1 *N* HCl. Heat on a water bath at 50° to 60° for 10 min., cool and mix with distd. water till it matches a standard color tube. To each 5 cc. add 1 cc. of 0.25 *N* NaOH. In 12 cases of infectious icterus there was no

change in HR. In only 1 of 8 cases of pernicious anemia was there an increase. In one of 5 cases of secondary anemia there was a slight decrease. The differences were never of sufficient degree to give the method any diagnostic value. There is a bibliography. JOHN T. MYERS

Blood groups in horses from the point of view of blood transfusion. KARL SANDNER. *Folia Haematol.* **36,** 366–76(1928).—Incompatibility occurred only 17 times in 2000 trials with 115 horses. Five combinations of agglutinin and agglutinogen were found: AO, B anti A, O anti A, O anti B and AB. No sp. combination for any breed was found. No isohemolysins were observed. JOHN T. MYERS

Toxic granules of neutrophilic leucocytes and their practical significance. ELIAS MATIS. Der I. med. Klinik, Charité (Berlin). *Folia Haematol.* **36,** 398–423(1928).—Toxic or abnormal granules can be demonstrated by the carbol-methylene blue method of Freifeldt as follows. The blood film is fixed for 3 min. in MeOH, placed in a mixt. of distd. water 20 cc., soln. I 7 drops and soln. II 5 drops, and allowed to stand for 1 to 1.5 hrs. at room temp. Soln. I is basic fuchsin 1 g., hot abs. alc. 15 cc., and distd. water 100 cc. Soln. II is 1% aq. methylene blue. In 12 normal bloods there were no toxic granules. They were absent in 29 cases of non-infectious diseases. They were present in all of 24 cases of severe infectious diseases. They were present in 34 out of 39 cases of active pulmonary tuberculosis. They were present in 10 out of 18 cases of mild infectious diseases. In general the size of the granules parallels the severity of the infection; hence their demonstration is useful in diagnosis and prognosis. The disadvantages of the method are: the difficulty of making uniform stains, the time required in making the stain, and the failure of the technic in about 20% of the attempts. JOHN T. MYERS

The occurrence of multiple zones in the serum precipitation reaction. NIEL E. GOLDSWORTHY. Univ. of Cambridge. *J. Path. Bact.* **31,** 525–39(1928).—Twenty-five sera obtained at different stages during the immunization of 9 rabbits against horse serum were tested. Of these, 6 showed but one zone of particulation, and of the 6, 3 showed faint or doubtful indications of a secondary zone. Twelve samples showed 2 definite zones and 3 of these gave uncertain indications of a tertiary zone. Seven samples showed 3 zones of particulation and one of these had a suggestion of a 4th zone. Hence multiple zones occur rather commonly. Mixts. in which the amt. of antigen is more than optimal are more apt to show supernumerary zones. JOHN T. MYERS

Observations on the part played by alcohol in the Wassermann reaction. C. H. BROWNING AND E. M. DUNLOP. Univ. and Western Infirmary, Glasgow. *J. Path. Bact.* **31,** 541–7(1928).—In the Wassermann test when heated sera are used, differences in the complement fixing power of ext emulsions which vary in alc. content are usually directly related to the alc. concn. Increase in the concn. of alc. is not, however, associated with any regular and definite increase in sensitiveness when tested with many sera, but is manifested with only a few. JOHN T. MYERS

The gastro-intestinal flora in pernicious anemia. L. S. P. DAVIDSON. Univ. of Edinburgh. *J. Path. Bact.* **31,** 557–82(1928).—There is no evidence that bacterial toxins are of etiological significance in pernicious anemia. The quant. increase of bacteria at different levels of the small intestine is significant, but there is no evidence of any sp. single species. There is a good bibliography. JOHN T. MYERS

The effect of certain liver extracts upon the survival of parathyroidectomized cats. M. M. GORBUNOVA. State Inst. Exptl. Med., Leningrad. *Arkh. Biol. Nauk* **28,** 37–9(1928).—Parathyroidectomized cats receiving liver exts. and perfusion liquids of isolated livers failed to survive longer than the control animals, all of them dying after about the same time with symptoms of tetany. W. A. PERLZWEIG

Prolonged experiments with intravital staining in rabbits. M. I. GESSE. State Inst. Exptl. Med., Leningrad. *Arkh. Biol. Nauk* **28,** 235–59(1928).—Daily injections during 4–12 months were carried out on 14 rabbits with carmine, trypan blue and India ink, and the tissues were examd. histologically. No qual. differences were observed in the end results with carmine as between shorter and longer expts. After 10 months of trypan blue treatment large deposits of the dye were found generally distributed in the cells of the reticulo-endothelial system, particularly in the liver, spleen, spinal cord, lymph nodes and connective tissue. Smaller deposits were found also in the epithelium of the biliary vessels, cartilage, renal tubules, endothelium of the eye, cornea and the smooth muscles. Injection of India ink during 1 year led to the formation of great deposits in the reticular endothelium of the liver, spleen and spinal cord, much less in the lymph nodes. In all of these organs, and especially in the lungs and in the renal glomeruli, many macrophages were found causing capillary emboli. Granules of all

of the dyes were also found in the epithelial cells of the liver. Not a grain of these substances was found in the reticulo-endothelial cells which were newly formed.

W. A. PERLZWEIG

The influence of the thyroid gland upon the development and the course of diabetes. V. G. BARANOV. State Inst. Exptl. Med., Leningrad. *Arkh. Biol. Nauk* **28,** 275–83 (1928).—The administration of thyroid ext. to partially pancreatectomized dogs either brought on or intensified glucosuria and polyuria. In other partially pancreatectomized dogs the ablation of one thyroid caused a temporary disappearance of glucosuria, while the ablation of the remaining thyroid caused a complete cessation of glucosuria, which returned upon the administration of thyroid ext. In other animals thyroidectomy did not bring about the same results. The thyroid is believed to exercise a modifying effect upon the function of the pancreas but no direct effect upon carbohydrate metabolism.

W. A. PERLZWEIG

Studies concerning the influence of a disturbance of the acid-base equilibrium of the blood on renal function and pathology. Study IV. The protection of the kidney against the injury from uranium nitrate by the use of sodium bicarbonate. Part 1. The protection of the acutely nephropathic kidney. Part 2. The protection of the kidney in which an acute nephropathy has been superimposed upon a chronic naturally acquired glomerulonephropathy. W. DEB. MACNIDER. Univ. of N. C. *J. Metabolic Research* **7–8,** 1–28(1925–26); cf. *C. A.* **18,** 2556–7.—The expts. were carried out on dogs. Conclusions: The nephrotoxic action of U nitrate is largely due to its ability to induce and maintain a disturbance in the acid-base equil. of the blood which is furnished the kidney and in which altered blood chem. environment this organ must attempt to functionate in a normal manner. In certain animals acutely nephropathic from U nitrate the use of $NaHCO_3$ maintains this equil. of the blood. In such animals there is less evidence of renal injury and a more perfect maintenance of renal function. In other acutely nephropathic animals and in all the animals with a natural acquired glomerulonephropathy in which an acute injury has been superimposed on the chronic process, the use of $NaHCO_3$ has been unable to maintain this equil. In such animals there was a marked disturbance in both the functional response of the kidney and in the histologic preservation of the kidney.

W. A. PERLZWEIG

Treatment of diabetic acidosis. S. H. KAHN AND W. H. OLMSTEAD. *J. Metabolic Research* **7–8,** 29–35(1925–26).—A clinical discussion of the various types of diabetic acidosis and of its treatment.

W. A. PERLZWEIG

Lactic acid content of pathological discharges. R. SCHELLER. *Munch. med. Wochschr.* **73,** 1879–81(1927); *Chem. Zentr.* **1927,** I, 3100.—Pleural transudates have the same lactic acid and sugar contents as the blood. In sterile lymph and leucocytic effusions the lactic acid content varies from 17 to 32 mg. %. In purulent pleural infections and in a tumor exudate the complete disappearance of glucose and high lactic acid values were found. In ascitic fluids of tumor cases high lactic acid and normal sugar values were observed. Transudates and exudates of the pleura as well as ascitic fluids show no evidence of glucolysis as long as purulent processes are absent.

W. A. PERLZWEIG

Hemolysis of chicken blood. G. E. SHATTUCK. New York Univ. *J. Gen. Physiol.* **12,** 17–28(1928).—Saponin and Na taurocholate cause hemolysis of nucleated chicken erythrocytes but leave the nuclei and "ghosts" in suspension, thereby making the end point of hemolysis difficult to read. The time-diln. curves of hemolysis with these compds. are of the same nature as those for hemolysis of non-nucleated cells. Na oleate causes hemolysis and in stronger solns. karyolysis of the erythrocytes. Viscosity changes are found in the lysin-cell system with strong concns. of Na taurocholate and Na oleate. The action of these lysins on the nucleated erythrocytes is apparently similar to that on non-nucleated erythrocytes.

C. H. RICHARDSON

Complement interference—a new explanation for the Neisser-Wechsberg phenomenon. ROSCOE R. HYDE. Johns Hopkins Univ. *Am. J. Hyg.* **8,** 730–9(1928).—The expts. support the following propositions: (*a*) Hemolysis is dependent upon the order of addn. of the complement components to the reacting system under certain temp. conditions. (*b*) The sensitized corpuscle absorbs a complementing property from the deficient guinea-pig serum at a warm temp. (*c*) The sensitized cell does not absorb the heat-resistant complement component from human serum. (*d*) The sensitized corpuscle that has been exposed to the complement components in the deficient serum will remove the third complement from the heat-inactivated serum at a warm temp. The evidence indicates that the prezone which results with excessive quantities of immune serum is due to the amboceptor, in the sense that this reagent supersensitizes the antigen, so that the complement components are attracted to the cell out of the order

necessary to effect their destruction. Excessive quantities of amboceptor deflect the complement indirectly through its union with the antigen; so that under proper temp. conditions its affinity for the complement components is changed and they are taken on the cell out of the order necessary to effect the destruction of the sensitized cell. Alexin consists of at least 3 components, and it appears that this reagent may be destructive to the sensitized cell in one order of addn., while in a changed order a protective action is effected. L. W. RIGGS

Insulin does not increase the fixation of blood sugars by the corpuscles. Refutation of the notion of glycemine. G. FONTES AND L. THIVOLLE. *Compt. rend. soc. biol.* **98,** 847–9(1928); cf. Haüsler and Loewi, *C. A.* **19,** 2674; **20,** 1470; **21,** 1149.—The conclusions in this study are contrary to those of Haüsler and Loewi, and are in agreement with those of Hedon, cf. *C. A.* **22,** 2204. L. W. RIGGS

Apropos the paper by L. Kepinov and S. Petit-Dutaillis on the influence of diabetic blood on the glucemia of the dog and the rabbit. F. RATHERY AND R. KOURILSKY. *Compt. rend. soc. biol.* **99,** 528(1928); cf. Kepinov, *C. A.* **22,** 3927.—Tests with 12 normal dogs and 2 rabbits by injection of human or animal diabetic blood led to no const. results. L. W. RIGGS

Influence of injections of "Wasserblau" on the development of antitoxic immunity in the guinea pig. DONALD FRASER. *Compt. rend. soc. biol.* **99,** 561–2(1928).—Under the exptl. conditions the injection of strong doses of "Wasserblau" before or during immunization by anatoxin neither prevents nor establishes sp. immunity, nor the production of diphtheria antitoxin. L. W. RIGGS

Mechanism of the action of the liver in the treatment of pernicious anemia by the method of Whipple. M. WEINBERG AND J. ALEXA. *Compt. rend. soc. biol.* **99,** 567–9 (1928). L. W. RIGGS

Bactericidal properties of pleural and peritoneal exudates of tuberculous subjects. YEVREM NEDELKOVITCH. *Compt. rend. soc. biol.* **99,** 579–81(1928).—Pleural and peritoneal exudates of tuberculous subjects act on bacilli of tuberculosis *in vitro* in a manner to prevent their development on culture media. Heating even to boiling did not destroy this property. L. W. RIGGS

Composition of the blood with reference to the menstrual cycle. I. Cholesterol. CH. O. GUILLAUMIN AND HENRI VIGNES. *Compt. rend. soc. biol.* **99,** 618–20(1928).— **II. Lecithin.** *Ibid* 620–2.—An attempt was made to relate the variations of the cholesterol and lecithin contents of the blood as functions of the duration of the menses, the duration of their interval and the date of the menstrual month in patients with benign gynecologic affections. L. W. RIGGS

Effect of cod-liver oil on the delayed coagulation time following experimental jaundice. JOHN C. BROUGHER. Univ. Oregon. *Science* **68,** 256–7(1928).—In expts. with 9 dogs cod-liver oil in doses of 30 cc. in 300 to 400 cc. of water by stomach tube consistently changed a delayed coagulation time in obstructive jaundice to normal. The efficacy of cod-liver oil in causing this change is probably based on its ability to increase the ionizable Ca. L. W. RIGGS

The iodine content of the soil, water and of some foods in regions afflicted with goiter. F. MEINCK. *Kl. Mitt. Ver. Wasserversorg Abwässerbeseitig.* **3,** 10–1; *Chem. Zentr.* **1927,** II, 1884.—Data are given for 4 communities in the Taunus (Germany). G. SCHWOCH

Changes in acid-base equilibrium in inflamed tissue. F. BRICKER AND F. SUPONITZKA. *Arch. exptl. Path. Pharm.* **133,** 103–6(1928).—No acidosis is to be found provided the circulation to the inflamed area remains unimpaired. G. H. S.

Effect of the central nervous system upon the processes of immunity. III. Relation of the sympathetic to the occurrence of agglutination. L. BOGENDÖRFER. Univ. Würzburg. *Arch. exptl. Path. Pharm.* **133,** 107–10(1928); cf. *C. A.* **22,** 985.—Ergotamine administered prior to the injection of killed paratyphoid B bacilli inhibits or prevents the appearance of specific agglutinins in the circulation. G. H. S.

Chemical findings in the blood of the dog after temporary obstruction of the pylorus. RUSSELL L. HADEN AND THOMAS G. ORR. Univ. of Kansas. *J. Exptl. Med.* **48,** 591–601(1928); cf. *C. A.* **21,** 3391, 3392; **22,** 116.—The toxemia characteristic of upper gastrointestinal tract obstruction may be produced by temporary obstruction of the pylorus. This procedure affords an opportunity for studying the toxemia in the absence of mech. factors, operative risk and infection. Animals which spontaneously recover from the toxemia may show a return of the blood chloride to normal when only distd. H_2O is given In such instances there must be a redistribution of the body store of chlorides. The administration of NaCl by mouth to animals which show a toxemia without evidence of spontaneous recovery causes a rapid return of the blood to normal.

There is a marked diuresis with high N excretion during the toxemia. This is evidently due to the increased protein destruction, which, however, ceases on the return of the blood chlorides to normal. C. J. WEST

Cause of the delay in the van den Bergh reaction in icteric serum. NORIBUMI SOFUE. Imperial Inst. Tokyo. *Proc. Imp. Acad. (Japan)* **4**, 27-9(1928).—Stromata of hemolyzed blood corpuscles cause a delay in the van den Bergh reaction, whether these stromata are previously injected into the animal from which serum is obtained or whether they are added *in vitro* to the serum. The stromata react with bilirubin *in vitro*, oxidizing the latter and producing colors analogous to those obtained in Gmelin's test. The biphasic and delayed reactions appear to depend on this phenomenon. C. J. WEST

Pancreatic activity in diabetes mellitus. SEIZABURO OKADA, TSUNAMOTO IMAZU, KWANICHI KURAMOCHI, KATSUO HORIUCHI AND TOSHIO TSUKAHARA. Tokyo Imp. Univ. *Proc. Imp. Acad. (Japan)* **4**, 134-5(1928).—The disturbance of pancreatic function manifests itself in the decrease of enzymic activity, or of the amt. of juice, or of both, the greatest alteration in enzymic efficiency and activity being in the proteolytic and lipolytic enzymes. There may be disturbances either in the internal or of the external secretion of the pancreas, or of both, the severity of the diabetes not necessarily running parallel to the degree of disturbance in the external secretion. C. J. WEST

Influence of fat-deficient diet on the growth of transplanted tumors. WARO NAKAHARA AND EIICHI SOMEKAWA. Inst. Phys. Chem. Research, Tokyo. *Proc. Imp. Acad. (Japan)* **4**, 236-9(1928).—The almost total absence of fats and lipoids in the diet does not perceptibly affect the growth in albino rats of transplanted tumors, both sarcoma and carcinoma. C. J. WEST

Increase in blood sugar in experimental sun-stroke of the rabbit. TSUNAMOTO IMAZU. Tokyo Imp. Univ. *Proc. Imp. Acad. (Japan)* **4**, 252-3(1928).—The blood of rabbits killed by exposure to the sun had a definitely higher sugar content than before exposure. Those rabbits which survived showed no hyperglycemia. C. J. WEST

Pancreatic secretion in disturbed secretion. SEIZABURO OKADA, TSUNAMOTO IMAZU, KWANICHI KURAMOCHI, MASAKA MATSUBARA AND TOSHIO TSUKAHARA. Tokyo Imp. Univ. *Proc. Imp. Acad (Japan)* **4**, 423-4(1928).—The pancreatic secretion is not necessarily disturbed by disturbed gastric secretion; it may be increased in some cases. Thus it is evident that the presence of HCl is not necessary in order to stimulate normal pancreatic secretory activity. C. J. WEST

Cytochrome in tumor tissues. HIDETAKE YAOI, HIROSHI TAMIYA AND WARO NAKAHARA. Tokyo Imp. Univ. *Proc. Imp. Acad. (Japan)* **4**, 433-5(1928).—Fujinawa rat sarcoma contains a large amt of cytochrome, an intracellar respiratory pigment. Flexner-Jobling rat carcinoma and Bashford mouse carcinoma contain a medium amt. and Rous chicken sarcoma either small or no demonstrable quantity. It is probable that these facts can be correlated with the difference in the ability of different types of tumors to withstand the deprivation of O. C. J. WEST

I content of milk powder (MATHIESON) **12.**

LABBÉ, MARCEL, AND NEPVEUX, FLORIDE: **Acidose et Alcalose. Physiologie. Pathologie. Thérapeutique.** Paris: Masson & Cie. 296 pp. F. 30.

H—PHARMACOLOGY

A. N. RICHARDS

Lipoid nephrosis in adrenalectomized rats and guinea pigs. F. D. GUNN, C. F. CORI AND F. A. HARTMAN. Univ. of Buffalo. *Proc. Soc. Exptl. Biol. Med.* **25**, 410-1 (1928).—There was a definite increase in the kidney lipoid of guinea pigs and rats after the removal of both adrenals. This increase was not so marked as that present in adrenalectomized cats. C. V. B.

Effect of thyroxine on growth rate and carbon dioxide production of chick embryo. ERNEST B. HANAN. Univ. of Buffalo. *Proc. Soc. Exptl. Biol. Med.* **25**, 422-5(1928).—When $^1/_{40,000}$ mg. of thyroxine is introduced into the air sac of the hen's egg at the 8th day of incubation there is a distinct increase in CO_2 production extending over a period of about 3 days. This is followed by a period of marked depression below normal, lasting 8 days. Doses as small as $^1/_{200,000}$ mg. produce no demonstrable effect on viability or metabolism. Larger doses ($^1/_{30,000}$ mg. or more) of thyroxine are generally fatal when injected into the air sac at the 6th or 8th day of incubation. A considerably larger amt. ($^1/_{600}$ mg.) is tolerated when dild. (possibly modified) by injection or absorp-

tion into the albumin at an earlier stage of development, but the period of incubation is not appreciably modified and the wt. accretion curve is not altered. C. V. B.

Some experiments on the etiology of diabetes mellitus. E. W. Schultz, S. J. Johnson and G. T. Akamatsu. Stanford Univ. *Proc. Soc. Exptl. Biol. Med.* **25**, 432–4(1928).—The authors were unable to confirm the observations by Bergey, who claimed that he had been able to produce diabetes mellitus in rabbits by a single intravenous injection of a Berkefeld filtrate of the urine of diabetic patients. C. V. B.

Studies on quinine and quinidine. V. Do they have a specific action on autonomic nerve ends? Erwin E. Nelson. Univ. of Michigan. *Proc. Soc. Exptl. Biol. Med.* **25**, 499–501(1928); cf. *C. A.* **22**, 2207–8.—Quinine and quinidine, though apparently having a selective action on the motor sympathetics to the blood vessels in cats and dogs, do not have such an action for all the motor fibers of the sympathetic division. C. V. B.

Significance of reticulocyte as index of regeneration in different types of experimental anemia. Richard Johnson and Hilding Berglund. Univ. Hospital, Minneapolis. *Proc. Soc. Exptl. Biol. Med.* **25**, 517–21(1928).—In phenylhydrazine anemia there was an exceedingly rapid regeneration of erythrocytes with as high as 41.3% of reticulocytes; the curve of reticulocytes ran parallel with the normoblast curve. In anemia in a dog injected intravenously with distd. H_2O, the response of the reticulocytes, erythrocytes and leucocytes was less intense than in the phenylhydrazine anemia. In anemia produced by repeated bleeding of a dog, the leucocytes were little affected; the response of the reticulocytes and normoblasts was less lively than in the other 2 anemias. Three factors appear of importance in estg. the regenerative value of a given reticulocyte count. Neither the percentage of reticulocytes, nor their total no. per unit vol. is sufficient for interpretation. The level of the erythrocyte count and its direction, *i. e.*, whether decreasing or increasing must be studied also. C. V. B.

Positive effect of tyrosine feeding upon excretion of the reducing urinary compound in myasthenia gravis. Hilding Berglund and Anne Lohmann. University Hospital, Minneapolis. *Proc. Soc. Exptl. Biol. Med.* **25**, 521–3(1928).—The feeding of a cyclic amino acid like tyrosine increases the amt. excreted of the reducing urinary compd. described in a case of myasthenia gravis. C. V. B.

Effects of in vivo prepared toxic products of B. coli upon the guinea pig. W. H. Harris and O. M. Larimore. Tulane Univ. *Proc. Soc. Exptl. Biol. Med.* **25**, 528–9 (1928).—Cultures of *B. coli communior* were injected into the peritoneal cavity of guinea pigs. The exudate from the resultant peritonitis, dild. and filtered through a Berkfeld filter, was injected subcutaneously into a series of guinea pigs. The resulting symptoms were not like those previously noted when the typhoid bacillus had been employed in a similar manner. C. V. B.

Antipyretic action of magnesium chloride alone and combined with amidopyrine. H. G. Barbour and J. E. Winter. Univ. of Louisville. *Proc. Soc. Exptl. Biol. Med.* **25**, 582–7(1928).—$MgCl_2$ was effectively antipyretic in hay-infusion fever of rabbits in doses of 200 mg. per kg. and upward. By combining $MgCl_2$ and amidopyrine in doses which separately are ineffective, marked antipyresis was produced in such rabbits. Antipyretic synergism was demonstrated by combining effective doses of these drugs. The combined doses proved slightly less toxic to normal white mice than would be predicted by the known toxicity of the 2 component drugs. C. V. B.

Influence of magnesium salts upon the toxicity and antipyretic action of the salicylates. J. E. Winter and H. G. Barbour. Univ. of Louisville. *Proc. Soc. Exptl. Biol. Med.* **25**, 587–90(1928).—Mg salts in mice appear to reduce the toxicity of salicylates. Mg augments the antipyretic action of Na salicylate and of aspirin. When Mg salts are given subcutaneously with salicylate to fevered rabbits, the earlier stages of antipyresis are characterized by marked synergism. C. V. B.

Antagonism of nicotine action by cocaine. C. H. Thienes. University of Oregon. *Proc. Soc. Exptl. Biol. Med.* **25**, 591(1928).—Cocaine prevented nicotine from producing its usual effect of depression on smooth muscle. Cocaine failed to prevent depression of intestinal segments by atropine. Thus it appears that cocaine affects the ganglia, or at least some portion of the enteric nervous system, as well as the smooth muscle. C. V. B.

Some aspects of the pharmacology of apomorphine hydrochloride. J. E. Gorrell and P. L. Gray. Univ. of Chicago. *Proc. Soc. Exptl. Biol. Med.* **25**, 619–22(1928).—The development of a green color in old (1 week to 1 yr.) apomorphine-HCl solns. appears to be accompanied by no qual. or quant. changes in the pharmacol. actions of the drug. Dogs receiving an emetic dose of apomorphine daily for 4 months exhibit

no tolerance or hypersusceptibility, and no nauseant conditioned salivary reflex similar to that of morphine appears. C. V. B.

The development of isoagglutinins following transfusions. K. LANDSTEINER, PH. LEVINE AND M. L. JANES. Rockefeller Institute. *Proc. Soc. Exptl. Biol. Med.* **25**, 672–4(1928).—In 5 individuals transfused several times with the blood of the same donor of their own group, no abnormal agglutinins were observed. In a 6th individual of group 0, 2 transfusions were made with blood from the same donor. An abnormal isoagglutinin was found in the serum of the transfused individual that reacted on numerous bloods, and stronger on several others than on that of the donor. From tests it appeared that an agglutinin of very slight activity was present originally in the serum of the recipient and that the amt. of this agglutinin was increased as a result of the transfusion. In the serum of another transfused individual were found agglutinins which acted weakly. C. V. B.

Bronchial perfusion of isolated lung as a method for studying pharmacologic reactions of bronchiolar muscle. TORALD SOLLMANN AND W. F. VON OETTINGEN. Western Reserve Univ. *Proc. Soc. Exptl. Biol. Med.* **25**, 692–5(1928).—Description is given of a method permitting the study of the responses of the bronchial muscle to autonomic and muscular poisons, and giving a clearcut picture of their action, without the interference of changes of the circulation or of the vol of the heart. This method is based on measuring the rate of flow of a Locke soln. through the bronchial tree; the fluid is allowed to drain off by filtration. C. V. B.

Glycogen formation under amytal anesthesia. H. M HINES, C. E. LEESE AND A. P. BARER. State Univ. of Iowa. *Proc Soc. Exptl. Biol. Med.* **25**, 736–7(1928).—About the same increase in muscle glycogen occurred following glucose injection in animals with, as without, amytal anesthesia. The increase in liver glycogen was over twice as great in unanesthetized animals as in those under amytal anesthesia. Animals under this anesthetic are therefore thought to be unsuitable for study of problems on carbohydrate storage. C. V. B.

Effect of ash of liver on blood regeneration in pernicious anemia. C. A. ELDEN AND WM. S. MCCANN. Univ. of Rochester. *Proc. Soc. Exptl. Biol Med.* **25**, 746–8 (1928).—The administration of liver ash to 2 patients with typical pernicious anemia resulted in the appearance of some of the preliminary phenomena of a remission (increase in percentage of reticulocytes). In neither case did a true remission occur until Minot's liver ext. was given. The active substance in liver ash was lost or inactivated by dissolving the ash in HCl, neutralizing with NaOH, and evapg. the salts to dryness. C V. B.

Sensitivity of isolated intestine of athyroid, normal and thyroxinized rabbits to physostigmine and adrenaline. CHAPMAN REYNOLDS Tulane Univ. *Proc. Soc. Exptl. Biol. Med.* **25**, 771–3(1928).—Duodenal segments from normal, athyroid and thyroxinized rabbits showed no significant or const. difference in their response to adrenaline (20 expts.), perhaps because, owing to the instability of adrenaline in the alk. Tyrode soln , it was impossible to obtain simultaneous contact of the same concn. of adrenaline with the segments In 16 expts., 12 showed a greater sensitivity to physostigmine in thyroxinized than in athyroid segments, 2 showed less and 2 were apparently equal in response. In 5 expts. the response of the thyroxinized intestine was greater than that of the normal rabbit intestine in one it was apparently equal. C. V. B.

Liver extract (perneman) for treating pernicious anemia and the experience therewith in Holland. ERNST LAQUER AND A. P. W. MIJENCH. Pharmaco Therap.-Inst. Univ. Amsterdam. *Nederland Tijdschr. Geneeskunde* **72**, I, 1664 70(1928); cf. *C. A.* **22**, 3929.—Favorable reports are made in 14 cases of anemia. The writers have analyzed various liver exts., detg the total N content (7 to 8%), the urea content (2 to 3%), the amino N (2 to 3%), the lipoid content (0.3 to 0.5%), the S content (0.7 to 0.8%), the P content (0.6 to 1.0%), and the reducing power according to Hagedorn and Jensen. Vitamin A was found to be absent. R. BEUTNER

Chlorine gas poisoning and the process of becoming accustomed to chlorine. G. LUTZ. *Zentr. Gewerbehyg. Unfallverhüt.* **14**, 175–6; *Chem. Zentr.* **1927**, II, 716–7.—At first breathing Cl gas has the ordinary well-known irritant effects, which are rendered essentially less pronounced by the use of coffee. Following this stage, there is apparent a tendency to become accustomed to the gas with cessation of coughing, but without diminution of other injurious effects, such as vasomoter (albuminuria) effects. Caffeine is to be used in combating these effects. C. C. DAVIS

The mechanism of hydrogen sulfide poisoning (cineomatographic representation). G. RODENACKER. *Zentr. Gewerbehyg. Unfallverhüt.* **14**, 176–8; *Chem. Zentr.* **1927**, II, 717.—The catalytic active Fe in the blood is converted into FeS by H_2S, as a result of

which there is cessation of oxidation processes, internal suffocation and increased O content of the venous blood. With 0.5% H_2S, "Elektroferrol" with 0.1% $FeCl_3$ had an intracardial healing effect in guinea pigs and rabbits. These 2 substances also had a beneficial effect in human subjects with H_2S-conjunctivitis. Given orally their influence is still appreciable but less pronounced. Animals exposed to 0.1% H_2S could not be saved by this treatment. C. C. DAVIS

The present status of experimental and clinical research on the cause of lead poisoning. PAUL SCHMIDT. Univ. of Halle. *Zentr. Gewerbehyg. Unfallverhüt.* **14**, 180–2; *Chem. Zentr.* **1927**, II, 717.—A *micromethod for the detection of Pb in exts. and organs of the body* is suggested. The Pb compd. is converted into PbO_2 and this is identified by the blue color imparted by the Arnold-Menzel-Trillat reagent. Tests of the value of the method were carried out on so-called "healthy lead carriers," who were free from symptoms of colic and paresis and with normal conditions of eyes and nerves. With these subjects, considerable quantities of Pb were found in the urine and in the blood stream. C. C. DAVIS

The condition of the blood from the qualitative point of view in carbon monoxide, lysol and aniline oil poisoning. ARNETH AND ALBACHT. *Zentr. Gewerbehyg. Unfallverhut* **14**, 225–8; *Chem. Zentr.* **1927**, II, 1732.—A discussion (cf. Arneth, *Qualitative Blutlehre* **IV**, Munster; cf. *C. A.* **15**, 2119). C. C. DAVIS

The influence of insulin on the action of ephedrine on the blood pressure of human beings. K. CSÉPAI AND S. V. PINTER-KOVÁTS. Univ. of Pest. *Munch. med. Wochschr.* **74**, 1011; *Chem. Zentr.* **1927**, II, 709.—The cardiovascular antagonism which has been observed between adrenaline and insulin does not occur between ephedrine and insulin. The effect of ephedrine on the blood pressure is not influenced by insulin. C. C. DAVIS

Action of light and cobra venom. MUCH, PEEMÖLLER AND HAIM. Univ. Hamburg. *Munch. med. Wochschr.* **74**, 1365–6; *Chem. Zentr.* **1927**, II, 1733.—Expts. showed that the action of cobra venom on red blood corpuscles is completely destroyed by irradiation with ultra-violet light. Cobra venom dild. 1:2000 was irradiated in quartz glass flasks with 72-fold erythematic doses from a Hg lamp 0.5 m. distant. While at a diln. of 1:5000 the non-irradiated venom in quantities of 1.0–0.25 dissolved completely 0.5 cc. of a 10% emulsion of human erythrocytes after 2 hrs. in an incubator; a corresponding sample with irradiated cobra venom showed no hemolysis even after 20 hrs. in the incubator. The toxicity of the venom toward white mice was destroyed or greatly reduced by irradiation. It may therefore be possible, instead of relying upon uncertain serum therapy, to carry out *prophylaxis with venom which has been attenuated by irradiation*, or to combine such an attenuated poison with irradiated or non-irradiated lipoid. C. C. DAVIS

Experimental investigations on tetramethylammonium oxalate ("Albiogen"). ADRIANO VALENTI. Univ. Milan. *Arch. farmacol. sper.* **45**, 49–66(1928).—The toxic doses of $(CO_2NMe_4)_2$ for frog, guinea pig, rabbit and dog are 0.0026, 0.008, 0.006 and 0.008 g., resp., per kg. Combination with $(CO_2H)_2$ does not alter the characteristic pharmacological properties of the quaternary NH_4 base. The toxic dose causes paralysis of the motor centers, while moderate doses (0.005 g per kg.) result in a marked increase in blood pressure and retardation of heart beat—phenomena due to a peripheral action similar to muscarine on the myocardium and the vascular walls. Renal secretion is activated, but this is again restored to normal by administration of atropine. The effects are quite prolonged but no secondary paralytic phase develops, the functions returning to normal as the drug is eliminated. On account of the oxalic acid present the therapeutic use of the drug by intravenous injection is inadvisable. A. W. D.

Action of selenium, tellurium and cobalt on carbohydrate metabolism. F. PELLEGRINO AND G. GAIZZONE. *Arch farmacol. sper.* **45**, 75–80(1928).—Intramuscular injection of H_2SeO_4 and H_2TeO_4 into rabbits resulted in all cases in an increase in blood sugar. This increase is attributable in only small measure to the acid reaction of the injected soln., since HCl of the same p_H gives only a slight and transient hyperglucemia. If the H_2SeO_4 or H_2TeO_4 is injected one hr. after an intramuscular injection of glucose (1 g. per kg.) there is also a slight but const. increase in blood sugar. However, these acids do not have the power of neutralizing the hypoglucemic effect of a $^2/_3$ rabbit unit of insulin. Intramuscular injection of $Co(NO_3)_2$ (1 cc. of 0.05 *N* soln. per kg.) produces a marked hyperglucemia in the fasting rabbit. When injected simultaneously with $^2/_3$ unit of insulin the hypoglucemic action of the latter is only partially neutralized. A. W. DOX

Influence of caffeine on the survival of the red corpuscles outside the organism. G. B. ZANDA. Univ. Cagliari. *Arch. farmacol. sper.* **45**, 81–91(1928); cf. *C. A.* **22**,

2985.—Addn. of caffeine to defibrinated blood retards the disintegration of the red cells. This effect is proportional to the amt. of caffeine used. With 1% caffeine the cells retain their structure about 4 times as long as in the controls. The comparisons were made by noting the vol. of sediment obtained on centrifuging the sample. A. W. Dox

Chemotherapy of malignant tumors. Cassio Starnotti. *Arch. farmacol. sper.* **45**, 113–52(1928).—Twenty-one cancer patients were given daily injections of colloidal prepns. for a period of 1 month; 6 received colloidal S, 5 colloidal Pb, 5 colloidal Cu and 5 colloidal Se. Blood counts and urine tests were made at the beginning and end of the treatment. The greatest improvement was noted with the S treatment. The erythrocyte count showed an increase and the general nutrition improved. All of the prepns. increased the leucocyte count, and diminished the pain and secretion. The action of these prepns. is not considered specific. A. W. Dox

Synergized morphine. Paramorphine. Vittorio Susanna. Univ. Naples. *Arch. farmacol. sper.* **45**, 193–9(1928).—"Paramorphine," a synergized morphine prepn. used in treatment of morphinism and claimed to have all the therapeutic applications of morphine itself, was subjected to animal tests in comparison with morphine. The synergizing constituents do not alter the morphine action on the isolated mammalian heart, the frog heart or the blood pressure Expts. on narcosis and respiration, however, show a potentiation of the morphine effect. The same dose gives a longer and more profound narcosis as compared to morphine, and the respiratory center becomes more depressed. With dogs and rabbits receiving daily doses, habituation does not develop and an increased dosage is not required to give the initial effects. When the administration of "paramorphine" is discontinued the general effects disappear and the animals return to normal. Synergism is shown also by the increased toxicity of "paramorphine" as compared to morphine. A. W. Dox

Clinical observations on the use of synergized morphine and heroine. Pericle Pozzilli. Univ. Rome. *Arch. farmacol. sper.* **45**, 200–8(1928).—Cases of arteriosclerosis, pulmonitis and morphinism are reported where treatment with "paramorphine" (morphine synergized with *l*-hyoscyamine) was used to advantage. A. W. Dox

The use of acoin in clinical practice. Guanidine therapy of diabetes mellitus. L. Cannavò. Univ. Messina. *Arch. farmacol. sper.* **45**, 218–40(1928); cf. *C. A.* **22**, 1397.—Acoin, $EtOC_6H_4N{:}C(NHC_6H_4OMe)_2.HCl$, is recommended in the treatment of human diabetes because of its insulin-like action and its low toxicity as compared to other guanidine derivs. In mild cases it may replace insulin wholly or in part. Daily administration of a few cg of acoin increases the patient's tolerance of carbohydrates and permits return to a practically normal diet. It diminishes blood sugar, supresses glucosuria and acidosis and leads to increase in body wt. A. W. Dox

Blood regeneration. J. Pal. Allgem Krankenhauses in Wien. *Wiener klin. Wochschr.* **41**, 1216–7(1928).—Daily oral administration of 10 mg. of histamine resulted in blood regeneration in primary and in secondary anemia. A prepn. of suprarenal cortex administered orally in 15 cases of secondary anemia gave 13 positive results. In 2 cases of pernicious anemia there was 1 positive result. D. B. Dill

Pharmacology of chlorophyll. T Gordonoff. Univ. Bern. *Z. ges. exptl. Med.* **54**, 294–312(1927).—Chlorophyll increases the contractility of the isolated frog heart in concns. of 1:20,000, the action being on the heart muscle. There is a similar action on intestine and muscle. The blood pressure increases somewhat and there is a slight diuresis. The minute vol. and the rate of respiration are somewhat decreased. Chlorophyll is retained in the spleen and liver and the hemopoesis is increased. Hemin has a similar but less marked action. Bibliography. F. L. Dunn

Changes in permeability following insulin injection. Wm. F. Peterson and Ernst. F. Müller. Univ. of Ill. *Z. ges. exptl. Med.* **54**, 415–38(1927).—The sugar, protein, cell and Ca content of lymph and blood were compared in dogs following insulin injections. An increased permeability similar to that observed with peptone and protein was observed. Bibliography. F. L. Dunn

Biochemistry of Bayer 205. W. A. Collier. Inst. argentinischen Landwirtschaftsministeriums. *Z. ges. exptl. Med.* **54**, 606–12(1927); cf. *C. A.* **21**, 964.—Sb derivs. have no effect *in vitro* on the Bayer 205-globulin combination, but appear to increase the rate of breakdown of this combination, *in vivo* suggesting the explanation for the value of alternating Bayer 205 and Sb compds. in therapeutics. F. L. Dunn

The action of pancreas extracts and insulin upon the blood sugar. J. Th. Kuznetzov. Wissenschaftlichen Inst. Leshaft in Leningrad. *Z. ges. exptl. Med.* **55**, 248–65(1927).—The alc. ext. was made from the pancreas of cats following essentially the method of Cohnheim and Hall (*Hoppe-Seylers Z. physiol. Chem.* **42**(1904); **47**

(1906); *Am. J. Physiol.* **18** (1907)). The ext. showed glucolysis in diabetic blood *in vitro;* the dialyzate and ash did not. Insulin did not show glucolysis *in vitro.* Heating the ext. in NaOH for a half hr. or heating to 120° for 20 min. did not destroy its glucolytic action. The ext. was effective when given by mouth. Conclusion: The discrepancy in properties between the ext. and insulin suggests that the pancreas contains another hormone which is of importance in carbohydrate metabolism. Bibliography. F. L. DUNN

Remarks on the work of L. Asher, "Studies of coramine and cardiazole." F. HILDEBRANDT. Med. Akad. Düsseldorf. *Z. ges. exptl. Med.* **55,** 284–6(1927); cf. *C. A.* **27,** 3960.—H. finds the convulsive dose for cardiazole to be 10–15 mg. per kg. in rabbits in contrast to Asher, who found it to be 5–10 mg. per kg. The dose of cardiazole is one-fifth of that of coramine. F. L. DUNN

The role of the reticulo-endothelial system in streptococcus infections. IV. Therapeutic studies with proteins, carbohydrate, vitamin and mineral salts. N. LOUROS AND H. E. SCHEYER. Staatl. Frauenklinik Dresden. *Z. ges. exptl. Med.* **55,** 702–23 (1927); cf. *C. A.* **22,** 2781.—Aolan, caseosan, novoprotin and lipatren were effective in protecting white mice against lethal streptococcus infections in daily doses of 0.1–0.2 cc. The value of atropine, adrenaline, pilocarpine, phystostigmine, lobeline, pituigan and klavipurin, in protecting mice suggested to L. and S. that the vasomotor neural system is of parallel importance to the reticulo-endothelial system in protecting the mice. Protein-free dialyzates of spleen, liver and carcinoma tissue were also protective. Carbohydrate solns. showed no effect, and mineral salt complexes only a slight effect. V. Therapeutic studies with carbon. *Ibid* 724–9.—Colloidal C protects by increasing phagocytosis, the bacteria being adsorbed by the C. The acid formation of the bacteria increased the activity of the C. Bibliography. F. L. DUNN

The effect of synthetic cycloethylamines upon the action of adrenaline and histamine on the autonomic end organs. VI. Results with cyclic side chain ethylamines. S. LOEWE. Univ. Tartu-Dorpat. *Z. ges. exptl. Med.* **56,** 271–333(1927).—The actions of 66 members of this group were studied pharmacologically in cats, dogs, rabbits and rats; 33 substances had not been studied pharmacologically before. F. L. DUNN

The action of veratrine. H. RHODE. *Z. ges. exptl. Med.* **56,** 398–401(1927).—R. studied the relationship between p_H and concn. of veratrine, cocaine, stovaine, novocaine and quinine, lethal for paramecia. Veratrine in combination with a local anesthetic increased the toxicity of the former. Calcium reduced the toxicity of veratrine. R. suggests that these changes are due to swelling and shrinking of the cell wall which affects the penetration of the veratrine. F. L. DUNN

The theory of action of poisons. Relationship between concentration and toxicity. WILHELM R. GLASER. Univ. Würzburg. *Z. ges. exptl. Med.* **56,** 410–32(1927).—An exptl. and math. study of the action of HCN and AsH_3 showing that the data satisfy the relation, $(C - b)[1 - e^{-a(t - g)}]$, in which C is the concn., b is a quant. poisoning factor, a is a proportionality factor related to diffusion, t is time and g a poisoning factor related to the time. F. L. DUNN

The pharmacologic action of an antipyrine derivative, antipyriliminopyrine. WERNER LIPSCHITZ AND JOSEF OSTERROTH. Univ. Frankfort. *Z. ges. exptl. Med.* **56,** 433–53(1927).—The chloride was used. In warm-blooded animals the effect on the medulla oblongata was most prominent. There was some depression of the respiratory center and the antipyretic effect was less than that with antipyrine and pyramidone. There was no effect on the heart. The drug was rapidly excreted. In frogs there was a curare action. In mammals the soporific effect was greater than for pyramidone. The lethal dose was: rabbits, 0.15–18; white mice, 0.3–0 4; dogs, 0.3; and frogs, 0.7 g. per kg. F. L. DUNN

The pharmacology of iron and aluminum in relation to therapeutic uses. H. A. MCGUIGAN. *J. Lab. and Clin. Med.* **12,** 790–4(1927); *Physiol. Abstracts* **12,** 584.—The absorption of Al is so slight that toxic effects are unusual when taken by the mouth; given hypodermically it becomes of toxic importance. The hypodermic administration of Fe is inadvisable as toxic actions almost invariably follow. H. G.

Permeability relationships in secretion of intraocular fluid. A. GAEDERTZ AND A. WITTGENSTEIN. *Klin. Wochschr.* **7,** 63–5(1928); *Physiol. Abstracts* **13,** 76.—Various substances were injected intravenously in dogs and their appearance in the intraocular fluid was followed. Diffusible anions are secreted into the eye; in this group were acid dyes, salicylic acid, thiocyanic acid, ferrocyanic acid, chloride, bromide and iodide. Cations were indiffusible, the substances tested being 8 basic dyes, 3 alkaloids, Ca, K and Na. Colloidal acid dyes also did not appear in the intraocular fluid. H G.

Poisoning by hydrogen sulfide. V. RODMAKER. *Zentr. Gewerbehyg. Unfallverhüt.* **14,**

205-7(1927); *Bull. Hyg.* **3**, 587(1928).—In a concn. of 1.5 vol. per 1000 the organism loses power to utilize O_2. The ganglion cell being very sensitive determines the clinical picture of H_2S poisoning. The destruction of these cells in the olfactory region prevents the perception of larger amounts. Doses of 0.15 vol. per 1000 show erythema, conjunctivitis or swelling of the eyelids and lacrimation. R. explains why the H_2S produced in the body has no ill effects. GEORGE F. GREENBANK

The occurrence of caffeine in human milk after the ingestion of coffee. E. SCHILF AND R. WOHINZ. Univ. Berlin. *Klin. Wochschr.* **7**, 1186(1928).—See *C. A.* **22**, 3698. MILTON HANKE

The pharmacology and physiology of iron. E. STARKENSTEIN AND H. WEDEN. *Klin. Wochschr.* **7**, 1220-5(1928); cf. *C. A.* **21**, 1494.—Ferric iron prepns. that are introduced into the body by any route are always inactive. This form of Fe is removed from the circulation by, and stored in, the spleen, and *only* in the spleen. The liver reduces this inactive ferric Fe to inactive ferrous Fe; the latter is then used for the synthesis of hemoglobin. Active ferrous Fe, as found in $FeCl_3$, is oxidized to the ferric condition by the body tissues. The ferric compd. so produced is quite different from any ferric compd. that is ordinarily introduced into the body; for it remains in the circulation for a long time and remains in the filtrate from deproteinated blood. The spleen does not remove this form of Fe from the blood and the liver can attack it only after it has been reduced to inactive Fe by the tissues. The therapeutic value of an Fe prepn. cannot be judged by the Fe depots in the spleen and liver. On the contrary, Fe that appears in these 2 organs is inactive and useless. MILTON HANKE

The influence of small quantities of water on vascular tonus. E. FLATOW AND M. MORIMOTO. *Klin. Wochschr.* **7**, 1265-6(1928); cf. following abstract.—The injection of 1 cc. of water into the femoral artery of dogs leads to a dilatation of the blood vessels of the leg. A hypertonic salt soln. leads to a constriction which is then followed by a dilation of the blood vessels. The cat is much less reactive. Water produces a slight dilatation in most cats; but it may, occasionally, produce a constriction. A constriction of the blood vessels is usually obtained, in rabbits, after injecting water. MILTON HANKE

Effect of small doses of adrenaline, of water, of hypotonic salt solution and of blood in causing vasodilatation in dogs. E. FLATOW AND M. MORIMOTO. Univ. Berlin. *Arch. exptl. Path. Pharmakol.* **131**, 152-8(1928); cf. preceding abstract.—Perfusion of the extremity with solns. contg. small amts. of adrenaline, with distd. water or with hypotonic NaCl solns. causes vasodilatation. Hypertonic solns. of NaCl cause a slight vasoconstriction with a subsequent dilatation. Freshly withdrawn hirudinized blood is inert but after a short exposure to the air it causes vasodilatation. G. H. S.

The mechanism of the action of synthalin. H. STAUB AND O. KÜNG. *Klin. Wochschr.* **7**, 1365-6(1928).—Synthalin is a protoplasmic poison. Its administration leads to a decreased respiration of the body tissue and an increased production of lactic acid at the expense of glycogen and glucose. Synthalin in 0.05% concn. inhibits the growth of bacteria. MILTON HANKE

Colloidal silver. **Its use for diagnostic and therapeutic purposes.** J. VOIGT. *Klin. Wochschr.* **7**, 1417-9(1928).—Solns. of any of the patented colloidal Ag prepns. contain appreciable concns. of Ag ion. As these solns. are dild., the no. of Ag ions increases. This phenomenon appears to be a property of the colloidal Ag and is independent of the protective colloid that is used to stabilize the Ag prepn. The Ag ions disappear when an unprotected colloidal Ag prepn. is mixed with serum. An examn. of serum with the ultra-microscope fails to reveal any individual particles. The colloidal Ag prepns. contain well defined particles that appear blue to blue-green in color. An enormous increase in the no. of particles is observed when the colloidal Ag prepn. is mixed with serum. The new particles are yellow in color which indicates that they consist of serum aggregates to which a large no. of very fine Ag particles have been adsorbed. The no. of the yellow particles is roughly proportional to the concn. of the serum. This may develop into a method for *estg. the number of colloidal mols. in a protein soln.* MILTON HANKE

Effect of metallic salts on the glucolysis and respiration of tissues. MAURICE JOWETT AND JOHN BROOKS. Univ. Liverpool. *Biochem. J.* **22**, 720-38(1928).—The toxicity to glucolysis is in the order HgI_2, $HgCl_2 > Cu > Zn > Cl > Ca$. At low concentrations Pb^{++} slightly accelerates glycolysis of malignant tissues and accelerates their respiration if at much higher concns. Glucolysis appears to be more sensitive than respiration to heavy metals in the case of malignant tissue. For normal tissues the converse is true. B. HARROW

Conclusions from extended experiments with nitrous oxide, acetylene, ethylene-

oxygen anesthesia. JULIUS D. GOLDMAN. *Dental Cosmos* **70**, 920–3(1928); cf. *C. A.* **21**, 274.—From numerous expts. on animals (albino rats, albino mice, cats, rabbits, guinea pigs, dogs), and extensive clinical experience with human subjects, a series of 27 conclusions is drawn concerning the use of gas mixts. for the production and maintenance of anesthesia. Thus, anesthesia did not occur until the % O_2 was less than 7 in N_2O-O_2 mixts., and less than 12 in C_2H_4-O_2 mixts., but occurred, as a rule but not invariably, when the O_2 content was 20 to 30% in C_2H_2-O_2 mixts. Symptoms of cyanosis did not appear when use was made of mixts. contg. C_2H_2-N_2O-O_2 and C_2H_2-C_2H_4-O_2. However, C_2H_2 tended to produce salivation. JOSEPH S. HEPBURN

Antiseptic compounds: some further derivatives of anilquinoline. C. H. BROWNING, J. B. COHEN, S. ELLINGSWORTH AND E. GULBRANSEN. *Proc. Roy. Soc.* (London) **B103**, 404–11(1928).—When the *quinoline nucleus* is modified, either by conversion into urethan derivs., or by condensation of the quinaldylurethans with nitroso compds., the resulting compds. are exceedingly active as bactericides. The phenyluramino compd. has only slight bactericidal properties. The acetylamino-β-naphthoquinoline compd. has a fairly powerful action on *Staphylococcus aureus* but only a comparatively slight action on *Bacillus coli*, while the unsubstituted β-naphthoquinoline compd. is very active. When the *benzene nucleus* is modified by addn. of further aromatic nuclei, the bactericidal power is not increased. However, addn. of cyclohexyl groups increases the activity. JOSEPH S. HEPBURN

Experiments and observations on the contact of animal tissue with bi-iodide of mercury dissolved in aqueous potassium iodide. H. CANDY AND W. BULLOCH. *Brit. J. Exptl. Path.* **9**, 179–81(1928).—HgI_2 is not appreciably sol. in H_2O, but is readily sol. in aq. solns. of KI. Such solns. do not have the corrosive action on instruments or tissues that characterizes the aq. solns. of $HgCl_2$, and they have been very extensively employed as disinfectants in the belief that they would possess a similar germicidal action. Expts on the disinfecting action of HgI_2 on catgut in the different stages of its manuf. show that HgI_2 cannot be regarded as a disinfectant of marked power whether dissolved in aq. solns. of KI or in EtOH or MeOH. Throughout the process the mol. unity of HgI_2 remains unimpaired. When attached to the tissue HgI_2 is attached as a unit still retaining its independent property of soly. in aq. KI solns. by which it can again become detached. The expts. incidentally suggest that the HgI_2 mol. has a greater degree of stability than has hitherto been suspected. HARRIET F. HOLMES

Insulin and the stomach. ERNST WIECHMANN AND WILHELM GATZWEILER. *Deut. Arch. klin. Med.* **157**, 208–15(1927).—X-ray examn. following a test meal showed that the subcutaneous injection of 40–50 units of insulin reduced by about 90 min. the time required for a healthy stomach to become empty. Peristalsis was strengthened in all cases. The stomach contents were removed in 10-cc. portions after the drinking of 300 cc. 5% alcohol colored with methylene blue. It was found by titration that the acidity of the stomach contents was not affected in a regular manner by the previous injection of insulin. In some cases the acidity was increased; and in those cases where the acidity was lowered it is probable that alk. duodenal juice had mixed with the stomach contents. P. Y. JACKSON

The pathogenesis of the toxic action of gaseous chlorine. I. L. KRICHEVSKII AND K. A. FRIEDE. *Krankheitsforsch.* **4**, 213–28(1927).—Histological studies show that gaseous Cl, *in vivo* as well as *in vitro*, brings about a disturbance of the degree of dispersion of the colloids of the blood and of the cells. Photomicrographs are given to show affected areas in the lungs, heart, liver, kidney, brain and marrow of rabbits exposed to Cl gas in such concns. that death occurred in a few minutes. P. Y. J.

α-Lobeline as a respiratory stimulant. WM. R. MARSHALL. McGill University Clinic, Montreal. *Arch. Internal Med.* **42**, 180–8(1928); cf. *C. A.* **21**, 2937 and CAMP, *J. Pharmacol* **31**, 392(1927).—α-Lobeline was given subcutaneously to 25 subjects (10 mg./150 lb.) and 2 dogs. In normal subjects the ventilation (I) increased by 12.81–68.3%, av. 31.25%, the vol. of each respiration (II) by 1.02–50.70, av. 14.98%. There is therefore actual stimulation with a max. 15 min and return to normal 30 min. after injection. The O_2 consumption (III) rose by 11.17%. The expired air showed in the 1st 5–10 min. an increase in CO_2 (washing out), followed by a decrease in CO_2 and increase in respiratory quotient (max. in 20 min.). The CO_2 content of arterial blood decreased 4.16% (by vol.) in human subjects, and 6.75% in dogs. The decrease of CO_2 persisted 1 hr. Under morphine and chloral hydrate I increased 12.5%, II 19.58%, III decreased 2.72%. Lobeline affects the vomiting center to the same extent; 12 persons became distinctly nauseated, 10 vomited persistently and severely. This and the drop of blood pressure observed by other authors are objectionable features in a drug. An intravenous injection caused temporary respiratory paralysis. MARY JACOBSEN

Toxicity of novasurol (merbaphen). Its action on the kidney of the rabbit. BENJAMIN J. JOHNSTONE AND H. M. KEITH. Dept. of Medicine, Henry Ford Hospital, Detroit. *Arch. Internal Med.* **42**, 189–216(1928).—Novasurol is somewhat less toxic than $HgCl_2$ (calcd. for the same Hg %). The toxicity increases with the dose/kg. The susceptibility of rabbits varies. Repeated doses equiv. to the therapeutic dose (3 cc./70 kg.) were toxic in certain animals. Tolerance for large doses over a long period of time may be established by allowing several weeks to lapse between the initial and the following doses. The kidney lesions resemble those produced by other Hg compds. Conclusions: The dose for a man of 70 kg. should not exceed 2 cc. The individual sensitiveness ought to be tested by a 0.5-cc. injection. MARY JACOBSEN

The effects of morphine and ether on the function of the kidneys. R. L. STEHLE AND WESLEY BOURNE. Dept. of Pharmacology, Faculty of Medicine, McGill University Clinic, Montreal. *Arch. Internal Med.* **42**, 248–55(1928); cf. *C. A.* **16**, 3700; **18**, 1141, 2381; **20**, 1115.—In dogs with bladder fistulas ether anesthesia causes anuria or oliguria and considerably reduces the *urea* concn (max. 4-5%). An initially high *Cl* content is also lowered, while an initially low one may be raised. The result is difficult to explain on the basis of the filtration-reabsorption theory and seems to point to a secretory mechanism. In morphine anesthesia the urine output is decidedly lowered while the urea and Cl excretion are hardly affected. Under combined ether-morphine anesthesia the excretion is considerably better than under ether alone This may be a salt diuresis but more likely less ether is needed to induce anesthesia in the presence of morphine and consequently there is less interference with the kidney function. MARY JACOBSEN

A case of solanine poisoning. ANTONIO ANGELETTI. *Giorn. farm chim* **76**, 309–14(1927).—Solanine was identified in the stomach contents of a chimpanzee 4 hrs. after death with the aid of the green $K_2Cr_2O_7$-H_2SO_4 color and the red color with Na_2SeO_4-H_2SO_4-alc. MARY JACOBSEN

Copper in medicine and industrial pathology. IV. Workers engaged in the mining and metallurgy of copper. VINCENZO MAZZI. *Rass. clin. terap. sci. affini* **27**, 192–212(1928).—In minute doses Cu compds. have a therapeutic effect. Large doses have a toxic effect (irritation of mucous membranes) with an indirect effect on the nerve centers. Ingested Cu causes violent vomiting and the elimination is also otherwise complete. A general systemic Cu poisoning in animals with unimpaired vomiting mechanism is unknown. Nor does chronic poisoning take place even with daily administration of doses too small to cause vomiting. Occupational Cu poisoning does not exist. The symptoms occasionally observed in workers must be attributed to impurities of the Cu ores or of the reagents used in the processes or to unsanitary general conditions. Large bibliography. Cf. *C. A.* **22**, 2788. MARY JACOBSEN

The treatment of pulmonary tuberculosis with sanocrysin. ATTILIO C. GRAPIOLO. *Rev. sud-americana endocrinol. inmunol. quimioterap.* **11**, 565–87(1928) (In Italian.)—Review and case histories. MARY JACOBSEN

Danger of narcotic drugs with neurosyphilis. FRED E. CLOW. *Am Med.* **34**, 253–4(1928).—A hypersusceptibility to morphine in neurosyphilis is reported. FRANCES KRASNOW

***p*-Phenylenediamine dermatitis.** H. H. HAZEN. *Am. Med.* **34**, 296–9(1928).—Twenty-five cases are reported due to hair dye and fur (rabbit, coney, leopard, squirrel, raccoon, Hudson Bay seal, sable). The cause is the use of p-$C_6H_4(NH_2)_2$ as a dye, which yields on incomplete oxidation quininediamine. This is very poisonous. F. K.

Carbolfuchsin paints in the treatment of certain cases of epidermophytosis. ALDO CASTELLANI. Tulane Univ. *Am. Med.* **34**, 351–2(1928).—Some success is reported. FRANCES KRASNOW

Dermatoses of anti-syphilitic treatment. H. WANSLEY BAYLY. *Am. Med.* **34**, 367–9(1928).—A case report which shows the intolerance of As, Hg and I and complete tolerance to Bi treatment. FRANCES KRASNOW

Untoward effect of narcotics and anesthetics upon robust and handicapped patients. JOHN L. YATES AND FORRESTER RAINE. Columbia Hospital, Milwaukee. *Ann. Surgery* **87**, 124–9(1928).—$CHCl_3$ causes a greater drop in O-carrying power than ether, ethylene or N_2O. The effect is slight in the normal but a drop of 15 to 25% in O-carrying power of anemic or heart-diseased individuals may mean a break in cardiac compensation. Opiates produce a slight alkalosis; N_2O and ethylene acidosis. There is less nausea with pantapon than with morphine. FRANCES KRASNOW

Colonic anesthesia in operations upon brain and spinal cord. CHARLES H. FRAZIER. Univ. of Penn. *Ann. Surgery* **87**, 161–71(1928).—In colonic anesthesia there is a method of inducing narcosis in which there is none of the sense of suffocation, no period of

excitement, no harmful influence upon pulse or blood pressure, no irritation of the upper air passages, a state of analgesia after consciousness has returned, a narcosis of uniform depth, the ether vapor is always warm, less nausea and vomiting and the amt. of ether in the system is a fixed known quantity. FRANCES KRASNOW

Effect of plasmochine on gamete destruction in malaria. W. MOLLOW. Univ. Sofia. *Arch. Schiffs-Tropen-Hyg.* **32**, 116–9(1928).—Plasmochine causes degeneration of the parasite. FRANCES KRASNOW

Cyanosis in plasmochine treatment. D. ORACHOWATZ. Univ. Sofia. *Arch. Schiffs-Tropen-Hyg.* **32**, 119–21(1928)—O_2-carrying capacity of the blood is lowered and cyanosis induced. FRANCES KRASNOW

Incidents in plasmochine treatment. WILHELM CORDES. *Arch. Schiffs-Tropen-Hyg.* **32**, 143–8(1928).—Plasmochine in daily doses of 0.1 g. is more toxic than quinine. FRANCES KRASNOW

Treatment of frambesia with bismogenol in northwestern "Hinterland" of Liberia. EDGAR MAASS. Mission Hospital Bolahun der Holy Cross Liberian Mission. *Arch. Schiffs-Tropen-Hyg.* **32**, 221–9(1928).—Good results were obtained with the drug. FRANCES KRASNOW

The therapy of black-water-fever. A G. TRABADOROS. Städt. Krankenhaus in Patras (Griechenland). *Arch. Schiffs-Tropen-Hyg.* **32**, 229–35(1928).—The combination of quinine and plasmochine is predicted as the medication of the future. F. K.

Yatren 105 in the prophylaxis and treatment of ordinary gastro-intestinal diseases in the tropics. H. KÜMMEL. *Arch. Schiff-Tropen-Hyg.* **32**, 256–61(1928).—Yatren 105 is recommended as a specific for intestinal diseases. FRANCES KRASNOW

A case of amebichepatitis cured with yatren. OTTO FISCHER. *Arch. Schiffs-Tropen-Hyg.* **32**, 326–7(1928). FRANCES KRASNOW

Yatren enemas as a rapid cure for bacillary dysentery. NORBERTO BACHMANN. *Arch Schiffs-Tropen-Hyg.* **32**, 327–8(1928).—Good results are reported. F. K.

Sodium chloride feeding in dropsy. A. VON KORÁNYI. *Arch. Verdauungs-Krankh.* **42**, 247–52(1928).—NaCl acts variously. It has a regulating effect on the osmotic exchange between the blood and the edemic fluid. The Na^+ increases the swelling of the tissue colloids. Of the several salts that may be used NaCl produces the smallest diuretic effect. FRANCES KRASNOW

The effect of rectal administration of alcohol on gastric secretion. HERMANN STEINITZ AND RUTH SCHERSCHEWSKY. Krankenhaus der judischen Gemeinde zu Berlin. *Arch. Verdauungsr-Kankh.* **42**, 520–30(1928).—A marked stimulation of the secretions was effected in practically all of 52 cases studied. Rectal injections of water, salt and sugar produced no marked effect. FRANCES KRASNOW

The action of alkaloid of "Chelidonium majus" on the gastro-intestinal canal. L. ALKAN. Berlin Univ. *Arch. Verdauungs-Krankh.* **43**, 46–52(1928).—Expts. made on tissues kept in Tyrode soln. show a reversible paralytic effect due to this alkaloid. When the tissue is treated at the same time with physostigmine, the effect of the latter is vitiated. Expts. *in vivo* show similar results The drug is not poisonous when administered subcutaneously in doses of 1.0 cg. per kg. body wt. (dog). This agrees with the findings of Probst and Hanzlik on rabbits. FRANCES KRASNOW

The mechanism of insulin action. JOHN C. HEMMETER. Woods Hole Lab. *Arch. Verdauungs-Krankh.* **43**, 182–96(1928).—Discussion and literature review. FRANCES KRASNOW

Tongue cancer and prophylactics such as radium treatment. PAUL LAZARUS. Marien Krankenhaus in Berlin. *Arch. Verdauungs-Krankh.* **43**, 283–99(1928).—Ra treatment is the method of choice. FRANCES KRASNOW

Dental anesthesia in the dog. E. R. FRANK. Kansas State Agr. College. *J. Am. Vet. Med. Assocn.* **73**, 232–4(1928).—Procaine is used to block the infraorbital nerve. FRANCES KRASNOW

Spinal analgesia. GREGORIO SINGIAN. *J. Philippine Islands Med. Assocn.* **8**, 45–9(1928).—Discussion with suggested changes in technic. FRANCES KRASNOW

Evaluation of the results of treatment of leprosy with the chaulmoogra derivatives. C. B. LARA. *J. Philippine Islands Med. Assocn.* **8**, 56–64, 263–72(1928).—589 negatives have been paroled or discharged from the Culion in the last 6 yrs. compared with only 47 cases for the previous 15 yrs. FRANCES KRASNOW

Yatren 105 in amebic dysentery. PEDRO T. LANTIN. Univ. of Philippines. *J. Philippine Islands Med. Assocn.* **8**, 78–81(1928).—Considerable therapeutic value was obtained in 26 cases. FRANCES KRASNOW

Results of antileprosy treatment of children in the Culion leper colony. CATALINO NICOLAS AND ELISA ROXAS-PINEDA. *J. Philippine Islands Med. Assocn.* **8**, 135–6,

314–7(1928).—Treatment of early or slightly advanced cases of leprosy in children with chaulmoogra prepns. (ethyl esters with 0.5% iodine) is attended by a large % of apparent cures. FRANCES KRASNOW

Schistosomiasis treated with antimony sodium thioglycollate and with antimony thioglycollamide. GEO. C. CHATTUCK AND PAUL T. WILLIS. Harvard Med. School. *J. Trop. Med.* **31,** 115–6(1928).—Both drugs markedly aided schistosomiasis cure. Put up in powdered form in capsules, they withstood the climate of tropical Africa for more than a yr. but finally deteriorated. In soln., Sb Na thioglycollate decomposes readily but Sb thioglycollamide seems to be stable. FRANCES KRASNOW

Sodium oleate and titanium-lipase in cancer treatment. D. GARDNER. *J. Trop. Med.* **31,** 194–6(1928).—Na oleate given in tablet form showed good results. An aq. soln. of lipase obtained by the Willstätter method, when treated with 10% Ti tetrachloride, gives a white powder. This compd. administered by mouth was used in cancer treatment and found beneficial. FRANCES KRASNOW

The effects of adrenaline on respiration. J. S. M'DOWALL. Univ. of London. *Quart. J. Exptl. Physiol.* **18,** 325–32(1928).—Reduction of respiration is followed by an increase if stimulation by other means is avoided. Adrenaline apnea is produced in a manner similar to and coincident with the vagal inhibition of the heart caused by adrenaline. Ergotoxine or ergotamine brings about a rapid, shallow, respiration which may be preceded by an evanescent reduction. After ergotoxine, adrenaline apnea is not only abolished, but adrenaline may cause a marked increase in respiration. If repeated, adrenaline may cause complete failure of respiration. FRANCES KRASNOW

The toxic effects of amines. A. R. JOHNSTON. Univ. of Cincinnati. *J. Infectious Diseases* **42,** 473–84(1928).—Death from the amines studied is the result of respiratory failure. No relationship exists between the no. of NH_2 groups in the mol. and its toxicity, including its edema-producing qualities. Pyridine and quinoline in which the N is bound with the ring produce general anesthesia Cadaverine and putrescine are not toxic, and fuchsin is only slightly so as compared to the markedly toxic p-$C_6H_4(NH_2)_2$. p-$C_6H_4(NH_2)_2$ on living rabbits manifests its action first peripherally (loss of locomotion), second by early acceleration of respiration, third by salivation, sonorous and labored breathing, edema of the tongue, nose, face, neck and salivary glands, or if sufficient amt. be given clonic seizures terminate the life of the animal before the edema stage is reached. It produces marked rigor in frogs. The hydrochloride is less toxic and has less edema-producing qualities than the base. $CaCl_2$ given with the compd. partially antagonizes its action. Tolerance to it is not obtained. Various amines have predilection for different tissues of the same animal. p-$C_6H_4(NH_2)_2$ has predilection for the same tissues removed from the body as in the living animal. Amines affect the action of the exposed intact frog heart but only in concns. above those tolerated in the living animal. Basic amines cause an increase in both muscle rigor and the swelling of muscles; both the rigor and swelling are greater than those produced by acids at any concn. The salts of the basic amines diminish both the rigor and swelling of muscles. Increased swelling of muscles may occur with relaxation. J. H. LEWIS

The combined action of convulsant drugs. L. SCREMIN. *Arch. sci. biol.* (Italy) **12,** 262–76(1928).—The combined action of convulsant drugs was studied: those whose action results in general contraction of a tetanic nature of all striated muscles (strychnine, codeine, caffeine, thebaine, narcotine, hydrastine, apomorphine, pyramidone and cocaine), also, those which give rise to intermittent shock or clonic contractions (picrotoxin, acetone, phenol, hydroquinone and nicotine). Two drugs at a time were studied. To insure the simultaneous action of the drugs, they were injected intravenously into rabbits of medium wt. Preliminary expts. were made to det. the minimum convulsive dose of each single drug. The pharmacol. action of the association of the two drugs was then detd. As a rule the two were mixed before injection. Complete data are given for three series of expts.: (1) strychnine-caffeine, (2) strychnine-narcotine, (3) strychnine-codeine. These represent 3 possibilities: unaltered, increased or diminished action. The results are also shown in graphical form in which the doses of caffeine or narcotine, or codeine are plotted as abscissas, and those of strychnine as ordinates. The diagonal straight line connecting the min. convulsive dose of strychnine with that of caffeine, narcotine or codeine is the locus of all points representing values corresponding to the summation or unaltered effect of the two drugs. Min. convulsive doses which fall below the diagonal show synergism or increased action, and those which fall above the diagonal show "degradation" or diminished action. When strychnine and caffeine act simultaneously in doses whose sum falls below the diagonal, the drugs very often remain inactive. By keeping the dose of strychnine close to the min. convulsive dose and gradually increasing the dose of narcotine, $^2/_3$ the min. dose of the latter must be

used to obtain an action with strychnine slightly less than the min. The behavior of strychnine and codeine is variable depending upon whether the dose for codeine is greater or smaller than 0.00011 g. mol. per kg. Other results: strychnine-thebaine, the combined action shows summation in all doses except for the proportion 0.5 to 0.5, which tends toward synergism; strychnine-hydrastine behave similarly; strychnine-phenol, strychnine-pyramidone, strychnine-apomorphine and strychnine-cocaine show "degradation" but in certain proportions the degradation is small and approaches summation. The conclusion from these results is that summation, synergism and "degradation" are not absolute and const. factors, but vary as a function of the ratio in which the drugs are united. PETER MASUCCI

Barbiturism. G. CORONEDI. *Arch. sci. biol.* (Italy) **12,** 299–305(1928).—The toxicological and pharmacol. action of alkyl derivs. of barbituric acid are being investigated exptly. and clinically. Following the oral introduction of these derivs., 90% of the drug has been shown to disappear from the stomach of a dog 3–4 hrs. after introduction. Elimination is principally through the kidneys. In man the rate of excretion of veronal per day was: 1st day 0.10 g., 2nd 0.03 g., 3rd 0.03 g., 4th 0.025 g. The drugs tend to deposit as follows: in man brain 0.106%, liver 0.030%; in rabbit brain 0.086%, liver 0.008%. Clinical observations indicate that serious disturbances take place in the respiratory tract 2–3 days after acute barbituric poisoning, culminating in pneumonia with fatal results. This complication in the respiratory tract has been observed in every age and sex and in very healthy individuals prior to the poisoning. P. M.

An arrow poison with heart action from Colombia, South America. C. G. SANTESSON. *Acta Med. Scand.* **68,** 287–304(1928).—An arrow poison acting on the heart coming from the new world is demonstrated for the first time. It comes from an as yet unknown tree of northwest Colombia It is obtained from the sap which flows from a circular incision in the bark. It contains a bitter and poisonous glucoside which, especially in the frog, produces typical systolic cardiac paralysis. Its action varies according to the animal. Thus, for frogs the toxic dose is 0.6 mg. per kg.; 1.0 mg. per kg. in rabbit and 22–30 mg. per kg. for chickens and mice, resp. The identity of this poison with the Pakurú-sap is not at all certain. S. MORGULIS

Two arrow heart poisons from the interior of East Africa. C. G. SANTESSON. Medico-chirurg. Inst., Stockholm *Skand. Arch. Physiol.* **54,** 175–88(1928). S. M.

Studies on the elimination of triphenylmethanesulfonic acid and carbinols in the urine. G v. FARKAS, G GYARGYI AND L. NÉMETH. *Biochem. Z* **187,** 363–8(1927).—The carbinolization of the triphenylmethanesulfonic acid dyes depends on the H-ion concn of the organism. It is difficult to decide whether the carbinol is in a finer state of dispersion than the dye. S. MORGULIS

The influence on blood formation and the metabolism of feeding active iron oxide and radiothorium in normal rabbits as demonstrated by the urinary carbon : nitrogen quotient. A. ALLEN GOLDBLOOM. *Biochem Z.* **192,** 250–71(1928).—Daily administration of 5 mg. active Fe_2O_3 ("Siderac") and of 75 Maché units of radiothorium in normal rabbits receiving a normal diet increases the urinary C:N quotient but does not cause an increase in the red cells. But with 150 Maché units of radiothorium and 5 mg. Fe_2O_3 per kg. and per day there was a rise in the number of erythrocytes in normal rabbits. **The influence of radiothorium on the urinary carbon : nitrogen quotient.** *Ibid* 272–97.—Repeated daily doses of radiothorium (22–240 Maché units per kg. and per day) causes a rise in the urinary C:N quotient depending upon the dose. A single intravenous injection of radiothorium (150–5000 Maché units) causes a gradually increasing C:N quotient. The change is usually due to alteration in both the C and N excretion but not infrequently to the increase in C or to a decrease in N. The limiting effect of small doses of radiothorium on oxidation is thus shown. Even after feeding for many weeks 120–240 units of radiothorium per kg. and per day none unless it be very minute traces becomes absorbed and is retained in the organism. S. MORGULIS

The distribution of bismuth in the blood. SVEND LOMHOLT. Städtisches Krankenhaus, Kopenhagen. *Biochem. Z.* **198,** 98–102(1928).—Bi is very largely combined with the plasma proteins and in equal amts. in the 3 fractions pptd. (1) by 1.37% $(NH_4)_2SO_4$; (2) by 50% $(NH_4)_2SO_4$; or (3) by heat. A small amt. seems to be bound by the white blood cells, while the red cells contain practically no Bi. The ultrafiltrate of the plasma is practically free from Bi, nor is any contained in the lecithin pptd. at 15° with abs. alc. S. MORGULIS

Transformation of benzene in the organism and methods of its determination. IDA D. GADASKIN. Lab. des Arbeitskommissariats. Baku. *Biochem. Z.* **198,** 149–56 (1928).—Poisoning with benzene is a composite effect of the toxic action of C_6H_6 and of

its oxidation product, C_6H_5OH. A colorimetric procedure is described for the benzene detn. in blood which is claimed to be of sufficient accuracy. S. MORGULIS

The response of chronic nephrosis to parathyroid and thyroid medication. D. S. LEWIS AND W. DEM. SCRIVER. McGill Univ., Montreal, Canada. *Ann. Internal Med.* **2**, 66–82(1928).—Four cases of chronic nephrosis were studied. One was a pure chronic or lipoid nephrosis; the others were chronic nephrosis with glomerulo-nephritis. The first case showed a marked response to parathyroid ext. while the second and third showed no response. The second became edema free after all treatment had been discontinued. The third became edema free following massive doses of thyroid ext. The fourth showed a rapid advance of the disease following thyroid medication. In no instance was the albuminuria affected by treatment, nor did the plasma proteins or albumin-globulin ratio show noticeable change, even when marked symptomatic improvement occurred. JOHN T. MYERS

Purpuric skin manifestations following the use of merbaphen. ALBERT M. SNELL AND LEONARD G. ROWNTREE. Mayo Clinic, Rochester, Minn. *Ann. Internal Med.* **2**, 97–103(1928).—If used cautiously, merbaphen has little untoward effect. It may be that its action as a diuretic depends on an effect on the capillary epithelium. When it causes purpura it may be merely exercising its usual effect, but on capillaries injured by disease. Hence purpura may be an expression of the underlying disease as well as an evidence of the true toxic effect of the drug. JOHN T. MYERS

The treatment of endamebiasis. PHILIP W. BROWN. The Mayo Clinic, Rochester, Minn. *Ann. Internal Med.* **2**, 177–91(1928).—The org. arsenicals and yatren seem to be valuable addns. to the treatment of endamebiasis. A combination of As and emetin is best. Auremetin by mouth may supplant emetin hypodermically. Treparsol and stovarsol are equally effective, but the former is preferable because it is eliminated rapidly. As produces a small per cent of reactions and should be used with care. Certain cases seem resistant, but with variation of drugs a cure can be secured in most instances. JOHN T. MYERS

The abuse of digitalis. WALTER A. BLOEDORN. *Ann. Internal Med.* **2**, 261–8 (1928).—Digitalis has a narrow margin of safety. Its use should never be left to untrained hands. JOHN T. MYERS

Diabetic therapy, with special reference to the newer remedies. ARTHUR A. HEROLD. *Ann. Internal Med.* **2**, 269–74(1928).—Our main reliance should be placed on diet and insulin. Some substance as synthelin may replace insulin in routine treatment but not in coma. JOHN T. MYERS

The effect of injections of hydrochloric acid on the gastric and duodenal mucosae. WM. J. GALLAGHER. Univ. of Chicago. *Arch. Surg.* **17**, 613–26(1928).—In one group of 7 dogs with jejunal transplants to the stomach, HCl was injected daily by stomach tube in amts. of from 200 to 225 cc. of a 0.22, 0.29 or 0.62% soln. Vomiting was frequent and mucus was present in large quantities. There was frequently some delay in the emptying time of the stomach. Acute ulcers appeared in the pyloric mucosa of 2 animals and a chronic ulcer in the fundal mucosa of one. The latter may have been due to repeated trauma of the stomach tube. The most constant findings were acute and chronic gastritis with multiple erosions, which were more marked with higher concns. of acid. A localized area of duodenitis, with erosions in 2, appeared in 4 of the animals. In a group of six control animals, a 0.62% soln. was introduced in similar amts. 2 or 3 times daily. Chronic ulcers were not observed. Other changes were similar but less marked. There was no delay in the emptying time of the stomach. HCl seems to be a factor in the etiology of gastric ulcers. Mucus may exert a protective action. JOHN T. MYERS

The mechanism of lead poisoning. Bone marrow changes in experimental lead poisoning. J. SPERANSKI AND R. SKLIANSKAJA. Staatlich. Wiss. Inst. f. Arbeitsschutz in Moskau. *Folia Haematol.* **36**, 289–315(1928).—The morphology of bone marrow in normal guinea pigs is quite const., and there are only a few unimportant variations in different bones. The pathological changes produced by the same poison are the same in different bones. In guinea pigs, Pb poisoning stimulates both the erythroblastic and the leucoblastic systems, but the former reacts so much more actively that the latter may be almost obscured. The intensity of the reaction depends on the dose of Pb, and the no. of injections. With 160 mg. of white lead per kg. per day of animal body wt., the pig usually dies before bone marrow changes appear. 120 mg. will cause a definite reaction, and 35 to 70 mg. will cause an intense reaction. In such Pb poisoning, the erythroblasts reach 60%, the normal being about 30%. The most noticeable increase is in immature cells as proerythroblasts, and macroblasts. In very marked reactions there is a myelogenous metaplasia of the spleen. Following hemorrhage or

therapeutic doses of As, there is a similar erythroblastic reaction. In Pb poisoning there is a close relationship between blood changes and bone marrow changes.

JOHN T. MYERS

The fate of colloidal iron administered intravenously. CYRIL J. POLSON. Victoria Univ. of Manchester. *J. Path. Bact.* **31,** 445–60(1928).—After the intravenous injection of colloidal Fe into rabbits, the greater part is held in the lungs, liver and spleen. Most of the Fe in the lungs is present as emboli in the vessels, while in the liver and spleen it is ingested by the endothelial cells. The lung Fe is removed from the vessels by phagocytes believed to be derived from lung epithelium. When the Kuppfer cells are charged with Fe they tend to be detached from the capillary walls and to collect in the lumina. Later they appear to fuse and form large multinuclear giant cells, like foamy "foreign body" giant cells. Fe enters the parenchymal liver cells later only, being transferred from the Kuppfer cells, none entering directly. Aggregation of the splenic phagocytes occurs, and by the end of the second week the cells degenerate, leaving granular depots of Fe in the splenic pulp. While embolism of the kidney glomeruli may be an immediate result, Fe is not found in the epithelium of the tubules until the end of the second week unless the tubules have been previously damaged. There is some evidence of an incerase in the bone marrow content of Fe. Fe appears to collect in the thoracic and abdominal lymph nodes and in the cecum which excretes it. The Fe in the other organs is scanty and restricted to the endothelium of the capillaries for the most part. Chem. examination shows that the amt. of Fe held by the lungs after a single dose depends on the degree of pulmonary embolism. Afterward there seems to be a transfer of Fe from lung to liver, the mechanism of which is unknown. There is a good bibliography. JOHN T. MYERS

The action of adrenaline chloride on the human heart. W. E. HUME. *Quart. J. Med.* **21,** 459–62(1928).—When adrenaline-HCl is injected into the vascular system of man it would seem to have a direct effect on the heart muscle as well as on the myoneural junctions of the sympathetic system. The injection of 10 minims subcutaneously may produce severe cardiac distress which is practically always temporary. The effect on the heart when given intravenously seems to vary directly with the diln. Five minims dild. with 4 or 5 vols. of water has less direct effect than 2.5 minims dild. with 1 vol. of water. Many electrocardiographic records of the effect of digitalis in the human are given. JOHN T. MYERS

The use of synthalin in the treatment of diabetes mellitus. GEORGE GRAHAM AND G. C. LINDER. St. Bartholomew's Hosp., London. *Quart. J Med.* **21,** 509–21 (1928).—Synthalin has an effect on glucemia and glucosuria of diabetics, but in this series it only acted in 8 out of 12 cases. The toxic symptoms are serious and should be avoided by small dosage with careful spacing. It should only be used if the patient will not try insulin. JOHN T. MYERS

The evolution of therapeutics. E. FOURNEAU. *Chimie et industrie* Special No., 475(April, 1928).—A brief outline of the development of the use of synthetic drugs in therapeutics since the beginning of the 19th century. A PAPINEAU-COUTURE

Insulin, phytochinine and Funk's factor. A. CONDORELLI. *Paris-médical* **18,** 89(1928); *Bull. soc. hyg. aliment.* **16,** 250(1928).—From the leaves of Gramineae C. isolated a substance which he designates as phytochinine and which has an exceptionally interesting action on the metabolism of carbohydrates. It has no action on the hyperglucemia due to injection of adrenaline, but reduces the hyperglucemia due to subcutaneous or endovenous injection of glucose, as well as the glucemia of dogs from which the pancreas has been removed and the glucemia of human diabetes. It seems to be identical with the factor A isolated by Funk from insulin. A. PAPINEAU-COUTURE

Investigations on calcium fixatives. G. MOURIQUAND, A. LEULIER, M. BERNHEIM AND (MISS) J. SCHOEN. *Presse médicale* No. **14,** 209(1928); *Bull. soc. hyg. aliment.* **16,** 247–8(1928).—When sufficient Ca is offered to the organism it frequently does not assimilate it, especially in pathological conditions, unless suitable fixatives are present. The action on exptl. rickets in rats of various substances which might act as such was investigated. Adrenaline (7 drops of 0.1% soln. *per os* or $^1/_{16}$ cc. subcutaneously, every 2 days), parathyroid powder (0.25 mg. per day *per os*) and thyroid powder had no prophylactic effect, adrenaline having a decalcifying effect. Cod-liver oil in small doses (3 drops per day per animal), ultra-violet light, Wood's light and milk powder which had been exposed to ultra-violet light exhibited antirachitic properties. Application of these results to human rickets and tuberculosis is briefly discussed.

A. PAPINEAU-COUTURE

The influence of calcium and potassium upon the action of certain cardiac drugs upon the isolated frog heart. S. L. GAUKHMAN AND E. S. GUREVICH. State Inst.

Exptl. Med., Leningrad. *Arkh. Biol. Nauk* **28,** 285–96(1928).—The effects of *strophanthin* and of *adrenaline* upon the frog heart were studied with varying concns. of Ca and K in the perfusion fluid. Ca produces a positive inotropic effect and negative chrono- and dromotropic effects. Toxic doses of Ca arrest the heart in ventricular systole. Absence of Ca has a negative inotropic effect and arrests the heart in ventricular diastole. The heart is twice as sensitive to changes in K concn. as to those of Ca. K produces negative ino- and chronotropic effects and arrests the heart in ventricular diastole. Perfusion fluid totally devoid of Ca and K is less toxic than one devoid of Ca alone. The toxic effect of strophanthin is directly and strictly proportional to the Ca concn. The stimulating effect of strophanthin is particularly manifest with the diminution of the Ca. Increase in the K concn. diminishes the stimulating and toxic effects of strophanthin. The action of adrenaline is also intimately connected with the concn. of Ca and K, inversely for Ca and directly for K. The regularity of the dependence of the action of cardiac drugs upon Ca and K concns. is emphasized, but the explanation of the problem still awaits solution. W. A. PERLZWEIG

The decomposition of dextrose in toxic insulin action. FISCHLER. *Münch. med. Wochschr.* **74,** 680–2(1928).—The toxic effects of insulin are due to an abnormal decompn. of dextrose and to an increased rate of formation of methylglyoxal. Traces of CHI_3-forming substances were recovered from the blood and muscles of animals poisoned with insulin. W. A. PERLZWEIG

The injurious action of potassium cyanide on the skin and on the human organism. HEINZ LANGE. *Metall* 1927, 85–6; *Chem. Zentr.* **1927,** II, 723.—The irritant action of KCN on the skin is described and the necessary precautions are given for industrial plants. J. S. REICHERT

Chemical irritation and poisoning. A. PÜTTER. *Sitzb. Heidelberg Akad. Wiss.* **1927,** No. 4, 3–27; *Chem. Zentr.* **1927,** II, 713.—Psychological studies on the relation between irritation and poisoning, and their swelling action. J. S. REICHERT

The action of ergotoxine in the mammalian heart. HAROLD L. OTTO. Univ. of Vienna. *J. Pharmacol* **33,** 285–93(1928).—Accelerator nerve action after ergotoxine and ergotamine was tested by the effect of faradic stimulation of the nerve trunks, or intravenous injection of adrenaline. Ergotoxine and ergotamine had little effect on the accelerator nerve mechanism of the heart in the cat and the dog. C. RIEGEL

The anuran in bio-titration of pituitrin. A. J. MCLEAN. Harvard Med. School. *J. Pharmacol.* **33,** 301–19(1928).—Expansion of melanophores in frog skin on perfusing the hind legs of a frog with a soln. contg. pituitrin is used as a method for detecting the presence of hypophyseal posterior lobe principle. The H-ion concn. of the perfusing fluid must be carefully controlled to make the results valid. Hypophysectomized tadpoles immersed in the fluid to be tested serve as crude indicators of the presence of posterior lobe principle. C. RIEGEL

Studies of chronic morphine poisoning in dogs. I. General symptoms and behavior during addiction and withdrawal. O. H. PLANT AND I. H. PIERCE. Univ. of Iowa. *J. Pharmacol* **33,** 329–57(1928).—Symptoms and behavior are recorded in cases of 24 addictions to morphine and 22 withdrawals. There was considerable variation in individuals and these differences were not dependent on length of addiction or size of dose at withdrawal. On the whole the symptoms show marked similarity to those observed in chronic morphine poisoning in man. **II. Changes in blood cells and hemoglobin during addiction and withdrawal.** I. H. PIERCE AND O. H. PLANT. *Ibid* 359–70.—During the period of addiction to morphine changes in red cells, white cells and Hb are not marked. During withdrawal there is a marked leucocytosis, with an increase in percentage of polynuclear neutrophiles. Red cells and Hb decrease during the period of withdrawal. **III. Blood sugar during tolerance and withdrawal.** *Ibid* 371–85.—The general level of blood sugar is higher during the 1st half of addiction than during the control period, and is lower during the 2nd half of addiction than during the 1st half, and sometimes lower than during the control period. For the 1st week or 10 days of addiction the injection of morphine is followed by a hyperglucemia of gradually decreasing degree. Later in addiction there is no increase in blood sugar after injection of morphine, although increases in dosage produce a slight elevation for a few days. This tolerance is rapidly lost when the drug is withheld. Immediately after withdrawal the blood sugar increases, usually reaching a max. in 2 to 5 days. Blood sugar then returns to a normal level. C. RIEGEL

The therapeutic value of etharsanol and proparsanol in experimental trypanosomiasis in rats and rabbits. W. K. STRATMAN-THOMAS AND A. S. LOEVENHART. Univ. of Wis. *J. Pharmacol.* **33,** 459–77(1928).—Rats and rabbits were infected with *T. brucei, T. equiperdum, T. equinum, T. Lewisi, T. Rhodesiense.* Subsequently etharsanol

or proparsanol was given. Etharsanol cured infections even when the drug was administered only late in the disease. Proparsanol was not as effective. C. RIEGEL

The therapeutic action of the monosodium salts of 2-*p*-arsonoanilinoethanol and 3-*p*-arsonoanilinopropanol in experimental rabbit syphilis. G. E. WAKERLIN AND A. S. LOEVENHART. Univ. of Wis. *J. Pharmacol.* **33**, 479–82(1928).—Both etharsanol and proparsanol have good healing properties. C. RIEGEL

Antagonism and reversals of contracted crop (esophageal) muscle caused by a variety of muscular stimulants. P. J. HANZLIK AND E. M. BUTT. Stanford Univ. *J. Pharmacol.* **33**, 483–95(1928).—Contracted circular muscle of the pigeon crop can be caused to relax by a no. of compds., including epinephrine, ergot, guanidine, pilocarpine, pituitary and tyramine. The antagonistic action is partial or complete, and with epinephrine and guanidine reversals are obtained. However, a given stimulant does not antagonize or reverse its own action. C. RIEGEL

Studies on crystalline insulin. VI. Further contributions to the question whether or not crystalline insulin is an adsorption product. VINCENT DUVIGNEAUD, E. M. K. GEILING AND C. A. EDDY. Johns Hopkins Univ. *J. Pharmacol.* **33**, 497–509(1928).—Cryst. insulin is dissolved in HCl, adsorbed on charcoal, and the charcoal extd. with phenol. A ppt. is obtained by addn. of water to the phenol soln. The dried ppt. has the same potency as the original insulin. The ppt. is extd. with Na_2HPO_4. The soln. obtained is active, as is also the residue, which can be dissolved in a fresh portion of phosphate. The powder obtained from the phenol soln. can be crystd., and the crystals so obtained are identical in cryst. form, behavior and activity with the original insulin. The results do not confirm the findings of Dingemanse, who reports obtaining a compd. more active than cryst. insulin by a procedure similar to that used here. **VII. The acetylation of crystalline insulin, and the behavior of insulin towards alkali.** H. JENSEN AND E. M. K. GEILING. *Ibid* 511–20.—An acetylated product is obtained by treating cryst insulin with Ac_2O at 0°. This compd. is only $^1/_5$ as active as the original insulin. Insulin does not undergo any marked change on treatment with 0.01 *N* NaOH. Acetyl insulin is dissolved, and the soln. is 3 times as active as acetyl insulin, although only $^1/_2$ as active as the original insulin. 0 01 *N* NaOH splits off H_2S from acetyl insulin, and it is thought that the lower activity of the regenerated insulin is assocd. with the liberation of H_2S. The splitting off of H_2S indicates the S in acetyl insulin is more labile than in insulin. C. RIEGEL

A comparative study of the prophylactic and sterilizing properties of certain organic arsenical and mercurial compounds in experimental rabbit syphilis. G. E. WAKERLIN AND A. S LOEVENHART. Univ. of Wis. *J. Pharmacol.* **34**, 15–22(1928).—To det. the prophylactic properties of the drugs, rabbits were inoculated with *Tr. pallidum*, and 24 hrs. later were given an injection of the drug to be tested. To det. sterilizing properties, 3 weekly injections of the compd. were given 8 weeks after infection. Arsphenamine and neoarsphenamine were effective in prophylaxis and in sterilizing. Tryparsamide was a relatively poor prophylactic agent and had no sterilizing power. Proparsanol, flumerin and sodium 1-mercuribis-3-nitronaphthalene-8-carboxylate had no prophylactic or sterilizing powers. It is suggested that because of the parallelism between prophylactic and sterilizing powers, and the shorter time consumed in detg. the former, that method be used in evaluating the therapeutic activity. C. RIEGEL

The therapeutic action of certain organic mercurial compounds in experimental rabbit syphilis. G. E. WAKERLIN AND A. S. LOEVENHART. Univ. of Wis. *J. Pharmacol.* **34**, 23–8(1928).—Mercuric salicylate and flumerin possess definite healing power in exptl. rabbit syphilis. Sodium 1-mercuribis-3-nitronaphthalene-8-carboxylate has comparatively little heating power. C. RIEGEL

The electromotive action of drugs as a cause of their toxicity. IV. The augmentor effect. R. BEUTNER. Univ. of Louisville. *J. Pharmacol.* **34**, 29–36(1928).—The drop in e. m. f. caused by adding pilocarpine to a system: Calomel electrode||nitrobenzene + oleic acid||Tyrode soln.||calomel electrode$^+$ is increased when Na oleate is present within a definite range of concn. This effect is similar to the augmenting effect of Na oleate on the constricting action of pilocarpine on isolated intestine in Tyrode soln. C. RIEGEL

The reversal by ergotamine of the effect of ephedrine on the blood pressure. F. R. CURTIS. Univ. of London. *J. Pharmacol.* **34**, 37–41(1928).—In cats, after ergotamine, ephedrine caused a drop in blood pressure. C. RIEGEL

Resistance to adrenaline in relation to different modes of heart arrest. E. BARDIER. *Compt. rend. soc. biol.* **98**, 1408–10(1928).—The sensibility of the heart to adrenaline is diminished in hemorrhage and is entirely suppressed in asphyxia. L. W. R.

Effect of phenylhydrazine and sodium nitrite on the blood. GY. PETRÁNYI.

Magyar Orvosi Arch. **29,** 202-14(1928).—The total quantity of the blood is lowered by phenylhydrazine-HCl treatment. This effect is due chiefly to the diminished quantity of blood cells, whereas the vol. of the plasma is usually increased. There were seen in the blood small bodies which probably originate from the destroyed blood cells, and their presence can be regarded as a sign of degeneration. Animals treated with $NaNO_2$ have the total vol. of the blood slightly decreased. The decrease is compensated by a marked regeneration which is not a sp. effect on the bone marrow but is probably a secondary effect to compensate cell destruction. Doses of 0.15 to 0.45 g. of $NaNO_2$ produced no undesirable symptoms except to increase the action above described. L. W. Riggs

Preliminary estimation of the vascular activity of ephedrine and *l*-adrenaline. L. Launoy and P. Nicolle. *Compt. rend. soc. biol.* 99, 3-5(1928).—The ratios of the activity and of the toxicity of *l*-ephedrine to those of *l*-adrenaline are, resp., 1:166 and 1:1000. Tests with the rabbit proved that with the same dose *l*-ephedrine-HCl caused about double the hypertension of that caused by synthetic racemic ephedrine-HCl. L. W. Riggs

Action of the ovarian hormone on the glucemia of the normal dog. F. Rathery, R. Kourilsky and (Mlle.) S. Gibert. *Compt. rend. soc biol.* 99, 529-32(1928).—The ovarian hormone has an action on the glucemia which is especially marked following intramuscular injections of an oil ext of the hormone. Aq. exts of the hormone even when intravenously injected are less active. In general, the folliculin ext. diminishes the glucemia of the male, and increases both in amplitude and duration the glucemia of the female dog. The hyperglucemic action of the hormone is observed in fasting glucemia. L. W. Riggs

Comparative influence of sodium bicarbonate and insulin on the urinary excretion of "acetone bodies" in the course of a water diet in the dog. F. Maignon and E. Knithakis. *Compt. rend. soc. biol.* 99, 604-6(1928); cf. *C. A.* 22, 2194.—A water diet did not cause ketosis in the dog. The administration of insulin to the fasting dog caused a diminution of both acetone and β-hydroxybutyric acid. $NaHCO_3$ has a similar action. L. W. Riggs

Action of nitrites on the gastric secretion. M. C. Mladoveanu. *Compt. rend. soc. biol.* 99, 606-10(1928).—Nitrites, and in particular $NaNO_2$, increase the vol. of the gastric secretion, the free HCl, the total acidity and the coeff. of Linossier. This increase of the gastric secretion by $NaNO_2$ is nearly equal to that caused by histamine, but its duration is less prolonged. L. W. Riggs

Action of adrenaline on muscular atony of the initial stage of curarization. F. Bremer and J. Titeca. *Compt. rend. soc. biol.* 99, 624-7(1928).—The rapid intravenous injection of adrenaline in doses of 0.08 mg. per kg. is capable of causing the transitory reappearance of the rigidity of decerebration of the cat, abolished by a previous injection of 0.25 mg. per kg. of curare. This decurarizing action of adrenaline is probably the expression of an actual antagonism between the hormone and the alkaloid. L. W. R.

Prolonged insulin hypoglucemia without symptoms. S. J. Maddock and Harry C. Trimble. *J. Am. Med. Assocn.* 91, 616-21(1928).—Following insulin administration, the blood sugar of diabetic patients and of depancreatized dogs may remain at levels of 50 mg. per 100 cc. or below for 1 to 6 hrs. without symptoms. Such periods may or may not be followed by hypoglucemic reactions. It is believed that this phenomenon, whose dangers are evident, is probably frequent in occurrence; that it is usually unrecognized, and that it may account for the difficulty so often encountered in regulating the administration of insulin. L. W. Riggs

Bactericidal action of mercurochrome-220 soluble and iodine solutions in skin disinfection. James S. Simmons. U. S. Army. *J. Am. Med. Assocn* 91, 704-8(1928).—Conclusions: Mercurochrome-220 soluble 2% aq. soln. is not effective in disinfection of the unbroken skin. The 2% alc.-acetone-aq. soln. of mercurochrome and the 5% alc. soln. are slightly better than the watery soln., but are feeble bactericidal agents on unbroken skin, as compared with I soln. The 3.5% alc. soln. of I is more actively bactericidal on the unbroken skin than any of the mercurochrome solns. tested (cf. following abstr.). L. W. Riggs

Mercurochrome and iodine as disinfectants of mucous membrane of mouth.

cannot be considered effective. I in dilns. of 3.5 or even 1.75% strength, preferably in glycerol, is an effective germicide for the disinfection of the oral mucous membranes (cf. following abstr.). L. W. Riggs

Mercurochrome-220 soluble and U. S. P. tincture of iodine. Comparison of germicidal efficiency in skin disinfection. G. F. Reddish and W. E. Drake. *J. Am. Med. Assocn.* **91,** 712–6(1928); cf. preceding abstr.—Two per cent mercurochrome in aq.-alc.-acetone soln. and tincture of I are about equally active in disinfecting the unbroken skin. A 5 min. contact of either of these disinfectants is sufficient for pre-operative skin disinfection. Because of the objections to tincture of I, the use of mercurochrome is recommended. L. W. Riggs

Intramuscular injection of dextrose. Jerome Glaser. *J. Am. Med. Assocn.* **91,** 722–6(1928).—The intramuscular administration of a 10% soln of dextrose in physiol. soln. of NaCl or distd. water is a practical and relatively safe method for raising the blood-sugar level, and is indicated in those conditions in which such a rise is desirable and other methods of administration are contraindicated. The contraindications are the presence of a known hyperglucemia, and possibly the presence of a bacteremia. The max. rise following an injection of dextrose soln. occurs within 30 min. L. W. R.

Behavior of sugar in blood and in abdominal effusions following the ingestion of dextrose. B. Bisbini. *Policlinico* **35,** 312(1928); *J. Am. Med. Assocn.* **91,** 683.—Conclusions: (1) The percentage of sugar will serve for the differential diagnosis of exudates and transudates. (2) In the exudates sugar is always present, but in much less quantity when the inflammatory symptoms are more marked. The sugar content is low in purulent fluids (3) In transudates there is always a higher sugar content—about the same as that of blood, or even higher. (4) On having the patient ingest, fasting, 50 g. of dextrose, fluctuations occur in the sugar content of the fluid and such fluctuations are minimal or nearly so in the exudate. They are much greater, however, in ascitic fluids. (5) The reason for the low sugar content in inflammatory effusions is still uncertain L. W. Riggs

Pharmacologic study of the absolute pressure of the heart. II. Study of the rabbit heart. Itaro Kikuchi. *Tohoku J. Expt. Med* **11,** 293–307(1928); cf. *C. A.* **22,** 4175. Adrenaline and digitalis compds (helleborein, strophanthin and digitoxin) cause a considerable rise in the abs pressure of the rabbit heart. Ca and caffeine cause a smaller rise in the abs. pressure, which in the case of caffeine in doses of 0.15 cc. of a 1% soln. is long in reaching a max., but the rise is more prolonged than with most of the drugs. Caffeine in a dose of 0.4 cc. of a 1% soln. caused a fall in the abs. pressure of the heart The tests with physostigmine were indeterminate. Sparteine, alc. and hexetone caused a fall in the abs. pressure. L. W. Riggs

The favorable influence of small combined alkali-belladonna doses on the acidity curve and disorders caused by acidity. Schellong. *Munch. med. Wochschr.* **74,** 1127–8; *Chem. Zentr.* **1927,** II, 1367.—Chem. tests with *gelonida stomachica* (manufacturer: Goedecke), a combination of ext. belladonnae 0.01, magnesia usta 0.6, and bismut. subnitr. 0.2. in tablets. In cases of gastric troubles on account of high gastric acidity good results were seen. G. Schwoch

Local vitamin application in skin diseases. H. Beck. *Münch med Wochschr.* **74,** 1129–30; *Chem. Zentr.* **1927,** II, 1365.—Local vitamin application in skin diseases is reported. The prepn. *vitrisol* (manufacturer: Dr. Schwabe, Leipzig), which is manufd. from spinach and submitted to a prolonged radiation with ultra-violet light, was employed. Besides pyoktanin, vitrisol contains various inorg. salts present in small quantities. In acne vulgaris and lupus vulgaris good results were obtained. The drug was applied by means of ionthophoresis. G. Schwoch

The role of magnesium phosphate in fatigue and rigor mortis of the muscle. Leonhard Wacker. *Münch. Med. Wochschr.* **74,** 1222–3; *Chem. Zentr.* **1927,** II, 1371.—Mg phosphate deposited in the resting muscle partly in insol. form goes into soln. to a considerable extent in case of fatigue and rigor mortis, because of the influence of the KH_2PO_4 forming. In rigor mortis more Mg phosphate is dissolved than in fatigue. In the alk. rigidity, the formation of lactic acid is very small and the KH_2PO_4 content low. Therefore, a much smaller quantity of Mg phosphate goes into soln. than in the case of acid rigidity. The known paralyzing effect of the Mg ions on the motor nerve-endings justifies the conclusion that Mg phosphate exerts a regulating action in the muscle. G. Schwoch

Accurate observation of some uncommonly protracted lead poisonings. A. Seitz. *Münch. med. Wochschr.* **74,** 1364–5; *Chem. Zentr.* **1927,** II, 1732.—Clinical report on Pb poisoning of 6 persons by drinking water contg. Pb. The beginning of the poisoning lies more than 15 years back. In 1920, the drinking water of certain buildings contd. 8 mg., at a later examn. 36 mg. Pb per l. In spite of changing the pipes giving off the Pb, the drinking water still had 2.6–2.9 mg. Pb per l. in 1927. In none of the cases the characteristic blue line on the gums was to be seen; on the other hand all the rest

of the symptoms of chronic Pb poisoning were present. In one of the patients tuberculosis brought forth a renewal of Pb poisoning symptoms which had vanished. The symptoms were now those of an acute Pb poisoning with articular pains followed by paralysis of the radial nerve, evidence for the persistence of the Pb deposits in the body and their slow excretion. Administration of I brought relief, though not recovery because of the long existence of the disease. G. SCHWOCH

The problem of chronic hydrogen sulfide poisoning. RODENACKER. *Zentr. Gewerbehyg. Unfallverhüt.* **14,** 205–7; *Chem. Zentr.* **1927,** II, 1187.—R. discusses the rapid fatal action of inhaled H_2S gas when present in a concn. of over 0.15 vol. %. Death sets in as a result of inner suffocation, because the organism quickly loses the ability to utilize O_2. Local disturbances of oxidation as seen in the form of skin eruptions and catarrhs of the eye appear already at a concn. of 0.015–0.115%, if skin or mucous membranes are exposed to a H_2S-contg. atm. for a certain length of time. The removal of the poison according to Warburg by means of the catalytic action of org. Fe compds. of the cell can be much hastened by intravenous injection of a suitable Fe prepn. On account of a large number of blood tests on laborers of factories with an atm. rich in H_2S, R. concludes that, though the personal sensitiveness toward H_2S may be different and may be augmented by certain diseases, a chronic poisoning is out of question, as the poison is continually removed, and when the limit of tolerance is reached, the gas is also excreted by respiration. Besides this, H_2S is formed and resorbed again in the mouth and intestine of all human beings; perhaps it also influences the peristalsis of the colon. In sufficiently low concn., H_2S is without danger for the processes maintained by oxidation as well as for those maintained by fermentation, even when instead of an Fe compd. a Cu compd. serves as the oxidative enzyme. G. SCHWOCH

The clinical picture of chronic lead poisoning. GEORG THOMA. *Zentr. Gewerbehyg. Unfallverhüt.* **14,** 212–5; *Chem. Zentr.* **1927,** II, 1187.—T. describes first the symptoms of the acute Pb poisoning which produces in the animal a central irritant effect, and intravenous S therapy with $Na_2S_2O_3$, which is being tried especially in America. He mentions the numerous sources for Pb poisoning and discusses thoroughly the clinical and other symptoms in chronic cases, the great difficulty and importance of early recognition, the variety of the disturbances occurring and the kinds of treatment. G. S.

Toxicity of the aromatic nitro compounds: the dinitrophenol. KOELSCH. *Zentr. Gewerbehyg. Unfallverhüt.* **14,** 261–8; *Chem. Zentr.* **1927,** II, 2082.—The general toxicity of *o,p*-$(NO_2)_2C_6H_3OH$ (I) is not so large as the one of the nitrated benzenes; nevertheless, I has to be counted among the more serious substances. This is true also for all its isomers. The tolerable dose by swallowing as well as by dust resorption lies between 0.02 and 0.03 g. per kg. body wt. Death is caused quickly by 0.05 g. Simultaneous intake of alc. increases the effect of the poison. When inhaling the vapors of melted I, the irritant effect of the O-N compds. prevails. Also through absorption by the skin, quantities of the poison causing death or disease may be taken in. The crit. doses for this process of absorption are 8 to 10 times as high as for the intake by mouth. In almost all the animals the kidneys were damaged. In protracted expts. also in the liver fat infiltrations could be repeatedly demonstrated; occasionally also a central fatty degeneration of the liver lobes could be seen. I seems to act by generally injuring the protoplasm. The action upon the blood could not be explained clearly. A special action on the central nervous system and the respiratory center does not seem to exist. For the industrial practice, caution and observation of the known protections are entirely necessary. For detecting I, the suspension of strips of white cotton is recommended.
G. SCHWOCH

Studies on lipochromes. I. The reaction of animals to the presence of carotin. CHARLES L. CONNOR. Harvard. *Am. J. Path.* **4,** 227–34(1928).—Carotin was extd. from carrots and purified. When injected intraperitoneally into guinea pigs, granulomatous lesions appeared, similar to those of familiar foreign body reactions. Carotin did not appear in the blood or urine of guinea pigs after injection or ingestion of relatively large amts. It produced no effect in a rabbit when injected intravenously.
F. B. SEIBERT

Human mercuric chloride poisoning by intravenous injection. E. L. HARMON. Western Reserve School of Med. *Am. J. Path.* **4,** 321–36(1928).—The clinical findings and pathol. lesions resulting from the intravenous injection of 5–6 g. $HgCl_2$ into humans are described. Quant. reports of the amt. of Hg found in some tissues are given in some cases.
F. B. SEIBERT

Ephedrine and ephetonin. F. R. CURTIS. Univ. London. *Lancet* **1928,** II, 226.—Ephedrine and ephetonin, which are optical isomers having the empirical formula $C_6H_5.CHOH.CH.CH_3.NH.CH_3$, are used in the treatment of asthma. They produce

dilatation of the bronchi similarly to adrenaline. The former is levo-rotatory and the latter optically inactive. Compared with adrenaline, 4 mg. of ephetonin and 2 mg. of ephedrine gave an equiv. effect and this is to be expected from the fact that 4 mg. of ephetonin contains 2 mg. of ephedrine and 2 mg. of inactive *d*-ephedrine. F. B. S.

Extent of storage of scilla glucosides in the frog heart. TH. OLIARO AND E. ROTHLIN. *Arch. exptl. Path. Pharm.* **131,** 138–51(1928).—The retention of scilla derivs. by the isolated frog heart was detd. by ascertaining the limiting concn., *i. e.*, the difference between the initial and end concns. of the glucoside. For scillaria A the limiting concn. was 1:900,000; for scillaria B 1:1,300,000 and for the natural mixt. of the glucosides (Sq. 1005) 1:1,000,000. For ventricular arrest the toxic doses (in mg.) were: scillaria A 0.00009; scillaria B 0.000145, Sq. 1005 (0.00011). Within fluid vol. limits of from 0.5 to 3.0 cc. arrest of the ventricle by scillaria A is dependent upon the abs. amt. of toxin per cc., the smaller the vol. the greater the necessary amt. of toxin per cc. G. H. S.

Action of apomorphine. E. NAVRATIL. Univ. Grag. *Arch. exptl. Path. Pharm.* **131,** 159–70(1928).—Apomorphine reduces the size of the pulsation and impairs auriculo-ventricular conduction, effects which are removed by washing with Ringer soln., when the heart shows a diminished susceptibility to adrenaline, Na oleinate, choline, acetylcholine and muscarine. The changes induced by apomorphine are practically irreversible. Under the same conditions the inotropic effect of stimulating the vagus or the accelerans is abolished, not because of paralysis of the nerves, but rather because the vagus and accelerans substances produced are inactive. Apomorphine does not alter the effect of $BaCl_2$ upon the heart. With blood vessel prepns. apomorphine treatment interferes with the action of adrenaline but not with that of $BaCl_2$. Apomorphine does not modify the action of adrenaline on the blood pressure of rabbits. G. H. S.

Comparison of intra-arterial and intravenous administration of poisons. O. EHRISMANN. Univ. Berlin. *Arch. exptl. Path. Pharm.* **131,** 171–85(1928).—Aside from the local anesthetics, atropine, codeine, thebaine (and morphine to some degree) and inorg. K and Ca are less active, insofar as lethal dose for guinea pigs is concerned, when injected into the artery than when given intravenously. Unlike KCl, NaCl is less toxic injected intracardially than when introduced into artery or vein. Adrenaline and *p*-hydroxyphenylethanolmethylamine are less active when injected into the artery. When tested through their effect on elec. irritability, the action of atropine, as well as that of nicotine, was as pronounced after intraarterial as after intravenous injection. The curve of serum Ca, following administration of $CaCl_2$, was the same after both methods of administration. Three factors—differences in local distribution, chem. destruction, and tissue absorption—play a role in the diminished toxicity after injection into the artery. G. H. S.

Effect of mucilaginous substances. GERHARD SCHÖNE. Friedrichs-Univ., Halle-Wittenberg. *Arch. exptl. Path. Pharm.* **131,** 186–99(1928).—The effect of a variety of mucilaginous substances—gum arabic, salep, gum tragacanth, carrageen, gelatin, calumba, althaea, agar, Iceland moss, sago and rice—upon reflex irritability to HCl in frogs was detd., only gum arabic, calumba and althaea showing any considerable activity. The degree of viscosity bears no causal relation to effect. Titrations with phenolphthalein and with Congo red as indicators showed that in the mixts. about 50% of the HCl was bound, 10% chemically, 40% loosely. The true acidity (p_H) of the mixts. amounts to only from 5 to 15% of the initially present HCl. The activity of mucilaginous substances depends in large part upon physico-chem. processes involving the adsorption of the HCl to the surface of the colloid particles. Beef blood serum behaves like a mucilaginous substance. G. H. S.

Comparison of the effects of *d*-, *l*- and *i*-camphor. VI. Studies employing the Ganter vessel preparation and the coronary circulation of the isolated cat heart. O. EHRISMANN AND W. E. ENGELHARDT. Univ. Berlin. *Arch. exptl. Path. Pharm.* **131,** 200–11(1928).—With the vessel prepn. all 3 compds. cause dilatation, but when given intravenously this is preceded by a transitory constriction. The coronary vessels are dilated by all 3 compds. G. H. S.

Proof of sedative action in animal experiments. ERWIN SCHLAGINTWEIT. Univ. München. *Arch. exptl. Path. Pharm.* **131,** 212–20(1928).—The animal under test is placed in a suspended container adjusted to a lever which yields a kymographic record; sedative effects of B, alone and in combination with pyramidone, somnifen, luminal and other agents are recorded. Boric acid suppresses strychnine convulsions, but caffeine stimulation was not prevented. G. H. S.

Intestinal peristalsis. VI. Physiological coördination of the movements of the longitudinal and circular muscles during peristalsis and the changes induced by physos-

tigmine. M. Baur. Pharmakol. Inst. Kiel. *Arch. exptl. Path. Pharm.* **131**, 233–54 (1928).—The coördination mechanism of peristalsis in the guinea-pig intestine is disturbed by physostigmine, which acts not directly upon the muscles but apparently through Auerbach's plexus. G. H. S.

Thiocyanogen as an agent for causing a fall in blood pressure. H. O. Behrens. Univ. Giessen. *Arch. exptl. Path. Pharm.* **131**, 255–61(1928).—Therapeutic expts. in man with KSCN or NaSCN are reported. In none of the 9 cases was the reduction in blood pressure sufficiently permanent to be of value G. H. S.

Concentration and action of narcotics upon the respiratory center. Elizabeth Csillag. Univ. Pécs. *Arch. exptl. Path. Pharm.* **131**, 279–88(1928).—The activity of the automatic respiratory center can never be diminished by const. concns. of narcotic without leading to a complete paralysis, *i. e.*, it behaves in accord with the all-or-none law of narcosis. G. H. S.

Quantitative study of the conductivity of nerves during narcosis. Anna Lánczos. Univ. Pécs. *Arch. exptl. Path. Pharm.* **131**, 297–304(1928).—Like irritability of the end app. of motor nerves, cond. conforms to the "all-or-none law of narcosis," differences in the behavior of the 2 phenomena being merely quant. G. H. S.

Mode of action of arsenic and related elements. VI. Action of hydrogen sulfide and hydrogen iodide salts on the frog muscle-nerve preparation. Richard Labes. Univ. Bonn. *Arch. exptl. Path. Pharm.* **131**, 305–21(1928); cf. *C. A.* **22**, 2411.—In many respects intoxication with H_2S resembles a simple suffocation, but differs in that treatment of the nerve-muscle prepn which has been exposed to H_2S with oxidizing agents leads to a further and irreversible injury, while treatment with a reducing agent leads to recovery. Furthermore, exposure of the H_2S-treated prepn to an abundance of O causes a loss in both direct and indirect irritability. With the muscle-nerve prepn. an oxidative NaI intoxication occurs, which is analogous to oxidative HI hemolysis, depending upon the formation of elementary I through the action of H_2O_2. **VII. Arsenic hydride hemolysis: An effect of colloidal arsenic.** *Ibid* 322–34.—In AsH_3 hemolysis the chief factor involved is the As derived through oxidation G. H. S.

Effect of local anesthetics on isolated blood vessels of the frog. Eduard Rentz. *Arch. exptl. Path. Pharm.* **131**, 357–66(1928).—As regards action in inducing vasodilatation, the anesthetics fall in the following order alypin (least active), novocaine, tutocaine, tropacocaine, eucaine B, cocaine, stovaine, psicaine (most active). Alypin and novocaine first cause vasoconstriction, then a vasodilatation which does not exceed the original condition. With tutocaine, tropacocaine, eucaine B and cocaine the vasoconstriction is followed by a dilatation beyond the normal state. With eucaine and cocaine the dilation appears earlier than with tutocaine and tropacocaine. Stovaine and psicaine are exclusively vasodilating, the reaction being within certain limits independent of the concn. G. H. S.

Comparison of the effects of cardiazole, coramine and scillaria upon vessels. K Fahrenkamp and H. Nocke. Univ Wien. *Arch exptl Path Pharm.* **131**, 367–75 (1928).—In a concn. of 1:100 cardiazole usually causes vasodilatation, while dilns. of 1:1000 cause constriction. When cardiazole 1:100 and 1:500,000 adrenaline are alternated the constricting effect of adrenaline is not manifested Successive treatments with cardiazole and strophanthin cause alternating constriction, thus, 1:1000 cardiazole constricts, 1:10,000 strophanthin dilates, 1:1000 cardiazole promptly constricts and 1:100 cardiazole dilates. With a constricting soln. (1:100,000) of strophanthin 1:1000 cradiazole causes vasodilatation. Vasodilatation is caused by 2.5% coramine, vasoconstriction by 0.25%. Following treatment with adrenaline 2.5% coramine always dilates, 0.25% constricts. The dilatation due to 1:100,000 strophanthin is replaced by constriction by 0.25% coramine, 1:100,000 and 1:200,000 solns. of scillaria cause vasoconstriction, 1:2 million and 1:20 million solns. dilate. G. H. S.

Localization of the sensitizing action of cocaine for the pupil. S. V. Anichkov and A. A. Sarubin. *Arch. exptl. Path. Pharm.* **131**, 378–82(1928).—Cocaine sensitization of the pupil for adrenaline only takes place when the sympathetic innervation is unimpaired. G. H. S.

Effect of adrenaline upon sugar mobilization in muscle. W. Grunke and A. Kairies. *Arch. exptl. Path. Pharm.* **133**, 63–8(1928).—In frogs the av. concn. of the perfusion fluid without added adrenaline was 0.164 mg. %, with adrenaline 0.360 mg. %. G. H. S.

Stimulation of the secretion of pituitrin by diuretics. H. Hoff and P. Wermer. Univ. Wien. *Arch. exptl. Path. Pharm.* **133**, 84–96(1928); cf. *C. A.* **22**, 638.—Dogs receiving diuretic agents such as euphyllin, novasurol and urea show a considerable increase in the secretion of pituitrin. Euphyllin injected intravenously into man exerts

a like effect. This response may be considered as a regulatory process to overcome impoverishment of the blood and tissues as regards water content. G. H. S.

Method of testing local anesthetics on sensory nerves of frogs. M. KOCHMANN AND H. BOEHMINGHAUS. Univ. Halle-Wittenberg. *Arch. exptl. Path. Pharm.* **133,** 121–8(1928).—A detailed description of the method of exposing the suitable nerves and applying the anesthetic. G. H. S.

Deposition of arsenic in the brain after application of neoarsphenamine, arsenious acid and arsenic acid. B. ENGELMANN. Univ. Berlin. *Arch. exptl. Path. Pharm.* **133,** 181–91(1928).—Repeated intravenous injections of neoarsphenamine, continued over a period of 2 weeks and involving a total of 120 mg. of As, resulted in no, or but slight, evidence of As deposition in the central nervous system of rabbits. With longer periods of treatment, the total dosage reaching some 300 mg. of As the brain revealed (av.) 0.04 mg. of As per 10 g. of brain substance. Higher values were found when the neoarsphenamine was injected in combination with sugar. A febrile state considerably increases the amt. of As to be deposited in the brain following intravenous injections of neoarsphenamine, a result apparently assocd. with the diminished As tolerance in fever. When neoarsphenamine is given during urethan narcosis the normal receptivity of the brain for As is reduced or abolished. Ether narcosis does not favor As deposition. Substances such as amyl nitrite, caffeine, and theophylline, which influence the blood vessels, do not increase the As transfer to brain tissue, nor does the brain seem to possess a greater tendency to acquire As because of a meningitis. When during a period of 5 to 6 weeks 25 mg. of As is given intravenously in the form of $NaAsO_2$, or 42 mg. as Na_2HAsO_4 not more than 0.02 mg. of As can be found per 10 g. of brain substance. Dogs which have received by mouth over a period of 5 ½ months a total of 3.6 g. of As_2O_3 show some 0.04 mg. of As per 10 g. of brain. G. H. S.

Local stimulating action of narcotics. ALEXANDER RIKL. Univ. Bonn. *Arch. exptl. Path. Pharm.* **133,** 192–201(1928).—A large series of narcotizing agents—alcs. and others—were tested upon the human eye and tongue for their local stimulating effect. In general their activity in this respect paralleled their narcotizing power. Of the substances tested phenol, camphor and menthol exerted the strongest local irritating effect. G. H. S.

Comparative study of the stimulating effect upon the respiratory center of some narcotics. WILHELM BLUME. Univ. Bonn. *Arch. exptl. Path. Pharm.* **133,** 202–26 (1928). Rabbits injected intravenously with aq. solns. of Et alc., heptyl alc. and ether give evidence of a stimulated respiratory center, an effect not manifested, or to but a slight degree, when $CHCl_3$ is injected. The most marked effects, in 2 kg. rabbits, were noted after the injection of 20 cc. of 5% Et alc., 20 cc. of 0.1% heptyl alc., or 20 cc. of 1% ether. When $CHCl_3$ is stimulating the effect is induced by 10–20 cc. of a 0.1% soln., and is not manifest until during the 2nd half hr. after the injection. Stimulation is not reflex in mechanism since it occurs when both vagi have been sectioned. The respiratory center impaired by morphine is stimulated by the same agents, but not by $CHCl_3$. G. H. S.

Effect of potassium tellurite upon phases of tissue respiration. RICHARD LABES. Univ. Bonn. *Arch. exptl. Path. Pharm.* **133,** 227–32(1928).—The capacity of minced muscle (guinea pig) to hydrogenate methylene blue with H activation is largely lost after treatment with K tellurite; but the same treatment does not impair the oxidation of *p*-phenylenediamine with O activation. G. H. S.

Effect of adrenaline upon the protein metabolism of isolated organs. B. S. SENTYURIN. Militär-Med. Akad., Leningrad. *Arch. exptl. Path. Pharm.* **133,** 233–41(1928).—When pure Ringer-Locke soln. is perfused through an organ (testis) for a long time the amt. of residual N present in the effluent gradually, but constantly, diminishes. The protein N diminishes also, during the first few hrs. of the perfusion but later increases. As a rule the amt. of protein N is greater than is the residual N, and as the perfusion continues this difference becomes greater. When adrenaline is perfused through the organ the amt. of residual N is increased, while the amt. of protein N in the effluent varies considerably, but usually the relation between protein N and residual N is altered, essentially through an increase in the latter. G. H. S.

Pharmacological study of sterols. HANS SEEL. Univ. Halle-Wittenberg. *Arch. exptl. Path. Pharm.* **133,** 129–80(1928).—Included in the study were α-cholesterol oxide, cholestantriol, cholestandionol, cholestendion, cholestandion, sitosterol, sitostantriol, oxycholesterol, oxysitosterol and β-cholesterol oxide. Upon the normal isolated frog heart all of these substances exert a stimulating effect, oxycholesterol being most active, but stimulation is most evident when the heart is fatigued and its action is impaired. With such hearts these substances frequently cause a complete restoration

of heart activity and a prolongation of its period of pulsation. β-Cholesterol oxide, oxycholesterol and oxysitosterol very definitely exert a detoxicating action upon hearts impaired by exposure to $BaCl_2$, $CuSO_4$, chloral hydrate, apomorphine, aconitine, apocholic acid and desoxycholic acid. In this action oxycholesterol and oxysitosterol are most effective. They are also detoxicating as regards the effects of thallium acetate, strychnine and camphor. Artificial irradiation has little, if any, effect upon the activity of the prepns. The stimulating effects are due primarily to sp. action on the heart muscle itself. With smooth muscle, such as the uterus, the sterols, particularly oxycholesterol and oxysitosterol, increase tonus and stimulate contraction. The sterols exhibit an antagonism toward adrenaline in its inhibitory effect upon uterine activity. Sterols have but little influence upon blood pressure, although in some instances a slight and transitory increase may be observed. Oxycholesterol stimulates metabolism and accelerates growth; O utilization is increased. Like irradiated cholesterol and cod-liver oil, non-irradiated oxycholesterol and oxysitosterol blacken photographic plates. When fed to rats only irradiated cholesterol exhibits antirachitic properties, and with the exception of oxycholesterol none of them has any effect upon xerophthalmia.
G. H. S.

Effect of some convulsion-producing poisons upon the blood sugar, the lactic acid and the alkali reserve. IJURO FUJII. Westf. Wilhelms-Univ. Münster i. W. *Arch. exptl. Path. Pharm.* **133**, 242–56(1928).—Picrotoxin and santonin cause an increase in both the sugar and lactic acid of the blood quite independently of the occurrence of convulsions, of effect upon the respiratory center or upon the body temp. The alk. reserve is reduced.
G. H. S.

The cerebral point of attack of α-lobeline. RUDOLF SCHOEN AND ERNST DERRA. Univ. Leipzig. *Arch. exptl. Path. Pharm.* **133**, 257–73(1928).—In its effect upon position and labyrinthine reflexes lobeline does not belong within the caffeine-camphor group. It causes convulsions in rabbits deprived of cerebrum but not in decerebrate animals. A characteristic respiratory arrest is induced and it is only with respect to respiration that lobeline is antagonistic toward morphine intoxication in both the intact and decerebrate animal. The cerebrum is not essential for the action of lobeline; the presence of the thalamus suffices to permit a complete picture of lobeline intoxication as seen in the normal animal
G. H. S.

Potential or phase effects of local anesthetics upon frog vessel preparations. ED. RENTZ AND C. AMSLER. Lettländischen Univ., Riga. *Arch. exptl. Path. Pharm.* **133**, 274–83(1928).—With alypine, novocaine, tutocaine, eucaine B and cocaine, prepns. of frog vessels reveal phase effects; stovaine and psicaine do not manifest like changes in activity.
G. H. S.

Effect of lobeline upon the circulatory apparatus. V. V. SAKUSSOV, JR. Militär-Med. Akad., Leningrad. *Arch. exptl. Path. Pharm.* **133**, 284–94(1928).—Lobeline exerts a vasoconstricting action through an effect upon the sympathetic system and through an indirect influence upon the adrenals. It stimulates the vagus center. Upon the isolated heart lobeline exerts a depressing effect, although with weak concns. an initial mild stimulation may be observed. It has no direct effect upon the walls of the vessels.
G. H. S.

Comparative study of the behavior of morphine rabbits intoxicated with morphine to pharmacologic agents which stimulate respiration. KONRAD SCHÜBEL AND WALTER GEHLEN. Univ. Erlangen. *Arch. exptl. Path. Pharm.* **133**, 295–316(1928).—Among the substances tested were lobeline, hexetone, cardiazole, camphogen, coramine and caffeine, the detns. involving the min. active dosage in mg. per kg. and the min. convulsion-producing dosage (from which are computed the therapeutic range and therapeutic index). Detns. were made for both intravenous and subcutaneous administrations.
G. H. S.

The alleged vasodilatation induced by high dilution of iodine salts. HERMANN FREUND AND WILLY KÖNIG. Westf. Wilhelms-Univ. Münster i. W. *Arch. exptl. Path. Pharm.* **133**, 317–24(1928).—The conclusions reached by Guggenheimer and Fisher to the effect that high dilns. of I salts cause vasodilatation and a reduced blood pressure could not be confirmed.
G. H. S.

Sugar content of whole blood in different vascular beds and its distribution between plasma and formed elements under normal conditions and after the administration of insulin and adrenaline as determined by the method of angiostomy in dogs. NINA KOCHNEV. *Arch. ges. Physiol.* (*Pflüger's*) **219**, 407–10(1928).—The hypoglucemia due to insulin is due to a diminished production of sugar by the liver and to a relative increase in sugar in the organs. Adrenaline hyperglucemia depends exclusively upon an increased sugar mobilization in the liver. During absorption from the intestine rela-

tively more sugar is taken up by the blood corpuscles than in hepatogenic sugar mobilization during fasting, in adrenaline hyperglucemia or in insulin hypoglucemia. In the fasting state only in muscle is the transfer of sugar about the same for both plasma and cells; in the spleen there is no transfer, and in all other organs the plasma is more involved than are the blood corpuscles. During alimentary hyperglucemia the kidney holds back more sugar of cellular origin than plasma sugar. Neither insulin nor adrenaline has any outspoken effect on the distribution quotients of the sugar excreted by the liver, although both of these substances are very important as regards the sugar of the blood and tissues. Under the action of insulin not only is the sugar relationship of the red cells and tissues changed, but a portion of the plasma sugar passes into the blood cells. Adrenaline acts differently in different organs as regards the distribution of sugar between plasma and tissue. G. H. S.

Effect of extreme dilutions of active substances on organisms. HERMANN JUNKER. *Arch. ges. Physiol.* (*Pflüger's*) **219**, 647–72(1928).—The expts. involve the effect upon paramecia of extreme dilns. (up to 1.10^{27}) of atropine, caffeine, the juices of orange and lemon, cocaine sulfate, Na desoxycholate, K oleate, octyl alc., AcOH, HCl, NaCl, $MgSO_4$, $CuSO_4$, urea, and rubio (a vitamin prepn.). G. H. S.

Fat and lipoid in the blood. IV. Distribution of fat and lipoid in the blood and the injection of insulin into dogs with pancreatic diabetes. MASAYOSHI MORIMOTO. Osaka. *Arch. ges. Physiol* (*Pflüger's*) **219**, 733–7(1928).—The concns. of fat and lipoid in the blood increase after complete removal of the pancreas. An injection of insulin promptly disposes of the increased fat in the blood. In hirudinized dog blood the corpuscles contain 156 mg. % (av.) of cholesterol and 395 mg. % total fat and lipoid, these values not being altered by pancreatogenic hyperlipemia or insulin treatment, although insulin has a marked effect upon the fat and lipoid content of plasma. G. H. S.

Potassium contraction in striated and smooth muscle. II. Permeability of muscle. ERNST GELLHORN. Univ. Halle a. S. *Arch. ges. Physiol.* (*Pflüger's*) **219**, 761–88(1928); cf. *C. A.* **21**, 2313.—In striated frog muscle K constriction is favored by the alk. chlorides in the series Li < Na, Cs < NH_4 < Rb, and inhibited by the alk. earth Ca, Sr, Ba and Mg, and somewhat more strongly by the chlorides of the heavy metals Co, Cd and Fe. Within the limits 6.1–7.7 K contraction increases with increased p_H. It is strengthened by hypotonic, weakened by hypertonic solns. As contraction augments the latent period is shortened. Anions favor the contraction according to the series Cl < Br, NO_3 < SO_4 < I < SCN. After exposure to different Na salts, Cl < I < SCN, KCl contraction is increased. With smooth muscle the alk. chlorides are stimulating as regards K contraction, in the series Li < Na < Cs < Rb. Mg and Ba change the tonus in such low concns. that their effect cannot be detd., but Ca and Sr are inhibitory, as are Co, Cu, Cd, and Fe. Increasing osmotic pressure and p_H reduce K contraction, and anions favor contraction in the order SO_4 < Cl < Br < I < SCN. Apparently both striated and unstriated muscle react to osmotic pressure and ionic concn. in the same way as regards K contraction, suggesting that in both, contraction is governed by the same physico-chem. processes. The effectiveness of osmotic pressure and ionic concn. is due to their effects upon permeability. G. H. S.

Effect of atropine on frog muscle. M. R. FRANCILLON. Physiol. Inst. Zürich. *Arch ges. Physiol.* (*Pflüger's*) **219**, 789–94(1928).—With rhythmic stimulation the summation capacity of atropinized muscle is lower than is that of normal muscle; to cause a complete tetanic contraction stronger and more frequent stimuli are necessary. The threshold of atropinized muscle is higher than that of normal muscle, and to weak stimuli atropinized muscle responds less vigorously. G. H. S.

Physiological action of 2-furancarbinol. M. OKUBO. Medical College, So. Manchuria. *J. Pharm. Soc. Japan* No. **539**, 39–44(1927).—The physiol. action of 2-furancarbinol is in most cases inhibitory and paralytic. Its dil. soln. paralyzes the sensory nerves. This suggests that it has an anesthetic action. In general, it resembles benzyl alcohol and represents an example where the physiol. action of an org. compd. depends greatly upon the side chain rather than upon the nucleus. N. U.

An experiment in toxicology: Antimony. J. WILSON DOUGAL. *Pharm. J.* **120**, 215–6, 225–6; *Chemist and Druggist* **108**, 353–4(1928).—Chem. analysis of a piece of *fur* which had caused *dermatitis* in wearing it (cf. *C. A.* **19**, 1199) at first gave indefinite results. However, when living *tadpoles* were employed in a systematic test for the toxicity of H_2O used in extg. the fur, a toxic effect was clearly noted, proportional to the amt. of fur used. The poison proved to be Sb, present in the ratio of 1:1000 parts of fur, added probably in the form of the mordant *tartar emetic*. The times required

to kill tadpoles in aq. solns. of tartar emetic of decreasing concns. were detd.; it appears that a 1:50000 soln. of Sb may be tolerated by these organisms. A 1:1000 aq. soln. rubbed on the skin causes smarting after 2 min. and develops a rash in 24 hrs.
S. WALDBOTT

Quanidine derivatives which lower the blood sugar. TAIZO KUMAGAI, SIN-ITI KAWAI AND YOSHIO SHIKINAMI. Tohoku Univ. *Proc. Imp. Acad. (Japan)* **4,** 23–6 (1928).—A large no. of guanidine derivs. have been prepd. and their blood-sugar-lowering actions detd. when administered to rabbits by mouth or subcutaneously. The action is exerted particularly by the polymethylenediguanidines. The following compds. have been prepd. by the condensation of the corresponding polymethylenediamines with ψ-thiourea in presence of HI; agmatine sulfate, m. 228°; tetramethylenediguanidine sulfate (not easily decompd. pure); pentamethylenediguanidine sulfate, decompd. 330°; hexamethylenediguanidine-HCl, m. 175–6.5°.
C. J. WEST

Toleration of the diuretic action of caffeine. GYOKUJO KIHARA. Tokyo Imperial Univ. *Proc. Imp. Acad. (Japan)* **4,** 418–20(1928).—Rabbits acquire a moderate degree of tolerance towards caffeine following upon repeated administration of gradually increasing doses of the drug. It requires approx. 4–6 months for the full development of toleration. The development of a decreased susceptibility to the diuretic action of caffeine is shown at first in the cessation of the extra-renal response and next in that of the renal response. But the renal vasodilatation to be seen immediately after the injection of caffeine appears in a caffeine-tolerant animal as well as in a control animal. An animal tolerant toward caffeine, theobromine and theophylline manifests a decreased susceptibility not only to the 1 but also to the other 2. In caffeine-tolerant rabbits, as in a control animal, no increase in the O consumption of the kidney is produced by caffeine injection.
C. J. WEST

The preventive action of metals against syphilis. C LEVADITI, V. S BAYARRI, R. SCHOEN AND Y. MANIN. *Ann. inst. Pasteur* **42,** 105–69(1928).—Rabbits were rendered resistant to subsequent exptl. infection with syphilis by the administration of finely divided Te, Bi, and certain derivs of the metals. The protection given by Bi may exceed that conferred by arsenobenzene and other arsenicals. The degree and duration of immunity depend both on the dose and on the nature of the metal deriv. administered.
ETHEL W. WICKWIRE

Emetine · its effect on the rabbit's heart. PHOEBUS BERMAN AND WM. H. LEAKE *California & Western Med.* **28,** 772–6(1928).—Emetine-HCl given intravenously to rabbits in doses of 1–2 mg./lb. of body wt. produces a distinct ventricular tachycardia. Normal rhythm returns in about 10 min. Digifolin even in very large doses produces no abnormal electrocardiogram Emetine-HCl digifolin combinations produce no definite changes unless the emetine is given in amts. equiv. to 2 mg. per lb. body wt. which is also the minimal lethal dose of the latter. Daily doses of 1 mg per lb body wt. produced no marked permanent changes in the electrocardiogram of rabbits receiving a total of 18 and 28 mg., resp.
R. C. WILLSON

NaN_3 (KAYSER) **24.** Health hazards in Cr plating (BLOOMFIELD, BLUM) **4.** The determination of gossypol structure (CLARK) **10.** Hydroxypropyltheobromine (WEIL, ROZENBLUM) **10.** The identity of yohimbine and quebrachine (RAYMOND-HAMET) **10.**

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I—ZOÖLOGY

R. A. GORTNER

The effect of certain electrolytes and nonelectrolytes on permeability of living cells to water. M. McCUTCHEON AND B. LUCKE. Univ. Penn. and Marine Biol. Lab., Woods Hole Mass. *J. Gen. Physiol.* **12,** 129–38(1928).—Permeability of the unfertilized eggs of the sea urchin (*Arbacia punctulata*) is greater in hypotonic solns of glucose, sucrose, and glycocoll than in sea water of the same osmotic pressure. The addn. to glucose soln. of small amts. of $CaCl_2$ or $MgCl_2$ restores the permeability to nearly that of sea water. The effect produced by $CaCl_2$ and $MgCl_2$ is antagonized by the addn. of NaCl or KCl. NaCl and KCl tend to increase the permeability of the cell to water, $CaCl_2$ and $MgCl_2$ to decrease it. A method for the quant. study of salt antagonism is given.
C. H. RICHARDSON

The digestion of oils by Amoeba dubia. J. A. DAWSON AND MORRIS BELKIN. Harvard Univ. *Proc. Soc. Exptl. Biol. Med.* **25,** 790–3(1928).—The protoplasm of *Amoeba dubia* has the ability to digest oils and therefore there is a lipolytic substance

present. Radiation with ultra-violet rays had a retarding effect on digestion of the irradiated oils, with the single exception of linseed oil. C. V. B.

Recent advances in science: zoölogy. F. W. ROGERS BRAMBELL. Univ. London. *Science Progress* **23**, 224–9(1928).—A review devoted in part to recent work on chromosomes and hormones. JOSEPH S. HEPBURN

Recent advances in science: agricultural physiology. JOHN HAMMOND. Cambridge Univ. *Science Progress* **23**, 229–38(1928).—A review of recent work on *reproduction*, including its biochem. aspects. JOSEPH S. HEPBURN

The chemical composition of the shell fluid and ash of Anodonta. D. W. SEUFFERT. *Beitr. Physiol.* 3, 295–332(1928). MARY JACOBSEN

Hook worm infection and popular anthelmintics. E. HASSLER. *Arch. Schiffs-Tropen Hyg.* **32**, 409–10(1928).—Review. FRANCES KRASNOW

Lactic acid and carbohydrate in sea urchin eggs under aerobic and anaerobic conditions. WM A. PERLZWEIG AND E. S. GUZMAN BARRON. Woods Hole Biol. Lab. and Johns Hopkins Univ. *J. Biol. Chem.* **79**, 19–26(1928).—Unfertilized eggs of *Arbacia punctulata* produce lactic acid under normal aerobic conditions. The amt. is notably increased under the anaerobic conditions produced by the addn. of KCN to sea water. There is also a slight increase after fertilization and in the early stages of cell division. With the eggs treated with KCN the greater concn. may be due to a retardation of oxidative processes; in the other instances the smaller increase might be due to an accelerated rate of oxidation causing loss of some of the lactic acid. The presence of free sugar and of glycogen could not be demonstrated but another investigator has reported the identification of glycogen in *Arbacia* eggs. Hydrolysis of the unfertilized eggs with acid yielded readily a fermentable reducing sugar from which an osazone was obtained. The anaerobic phase of metabolism of *Arbacia* eggs thus becomes quite analogous in its mechanism to that postulated for other tissues such as tumors, yeasts, etc. A. P. LOTHROP

Some physico-chemical phenomena in regeneration. I. Measurement of hydrogen-ion concentration in the regenerating extremities of the axolotl. N. OKUNEFF. Acad. Sci., Leningrad. *Biochem. Z.* **195**, 421–7(1928).—The continuous p_H detn. in the regenerating extremity of axolotls shows that there are 2 waves of increased acidity, one corresponding to the stage of wound healing, the other, to the stage of initiation of new cell proliferation. S. MORGULIS

The reaction of a natural protozoan community to some organic acids. DAGGMAR H. PETERSON. *Am. J. Hygiene* **8**, 741–56(1928).—The study was made of the protozoa in the liquid and sludge in Imhoff tanks of a sewage-disposal plant. The addn. of small quantities of lactic, acetic and butyric acids increased the no. of protozoa in a nutrient medium. Certain bacteria multiplied in the media to which these acids were added, and furnished food for the ciliates. The flagellates may have lived in a completely or partially sapropelic mode, and did not feed directly upon the bacteria. There was a critical concn. limit, where the percentage of acid in a nutrient medium became lethal to the protozoa. The lethal amt. appeared to vary for different species of protozoa. The p_H range between upper and lower lethal limits varied for different species of protozoa. *Euglena polymorphs* could subsist within a wider range of H-ion concn. than the other protozoa studied. L. W. RIGGS

Experiments on the automatic rhythm of heart strips of the soft-shelled turtle. I. Influence of the method of storage. HUNG-PIH CHU. Peking Union Med. Coll. *Chinese J. Physiol.* **2**, 285–92(1928).—Heart strips from freshly caught turtles (*Trionyx Sinensis*) react best. Turtles, kept 1 or 2 weeks by being buried in moist clay at a temp. between 22° and 24°, may be used. Market turtles give unreliable results. **II. Influence of the season.** *Ibid* 293–8.—When turtles in any season are exposed to different temps., the cooled animals behave like "winter" turtles, and the warmed animals like "summer" turtles. Winter or cooled turtle heart strips commence rhythmic activity immediately on immersion in 0.7% NaCl at 20°. The rate at first falls rapidly but after 1 hr. a slower rate is maintained without change until exhaustion of the muscle. Summer or warmed heart strips commence contractions only after being immersed for some time, but when rhythm begins it is maintained at a slow rate until the end. L. W. RIGGS

Nature of crystalloid formations contained in the "enigmatic vesicles" of Sipunculidae. A. DAMBOVICEANU. *Compt. rend. soc. biol.* **98**, 249–50(1928).—The substance in question forms on the filter during the filtration of the blood of *Sipunculus nudus*. After extn. in the Soxhlet app. with 95% alc. and repeated recrystns. the substance has the following properties: insol. in water, nearly insol. in cold alc., slightly sol. in acetone, readily sol. in $CHCl_3$, Et_2O, hot alc. and C_6H_6. It crystallizes from

hot alc. in needles, m. 50–55°, on recrystn. m. 40–45°. It does not give reactions for cholesterol, choline or P, and is probably a mixt. of aliphatic acids or salts of these acids.
L. W. Riggs

The loss of weight of Tenebrio molitor L. at the time of death by starvation is independent of the temperature. Georges Teissier. *Compt. rend. soc. biol.* 99, 602–3 (1928). L. W. Riggs

Rate of oxygen absorption by certain marine fishes as affected by the oxygen content and carbon dioxide tension of the sea water. Edwin B. Powers and Lula M. Shipe. Univ. Tennessee. *Pub. Puget Sound Biol. Sta.* 5, 365–72(1928).—The rate of O absorption in cc. per kg. per hr. during the first 10 min. of exposure by the herring (*Clupea pallasi*), silver salmon (*Oncorhynchus kisutch*), and by the viviparous perch (*Cymatogaster aggregatus*) is lowered by a decrease in the O content or by an increase in the CO_2 tension of the sea water in the order named. A combination of these factors is more effective than either one alone. The data indicate that the herring is more sensitive to an increase in the CO_2 tension of the sea water, and the silver salmon is more sensitive to a decrease in the O content of the sea water. The viviparous perch is more resistant to changes in these 2 factors than either of the other 2 fishes. This is in keeping with the fact that the alkali reserve of the blood plasma of the viviparous perch changes very rapidly with change in the CO_2 tension of the sea water. L. W. R.

Seat of elimination of urinary constituents in the toad's kidney. I. Inorganic substances. Kenzo Tamura, Otohiko Hayashi, Taiira Fujita and Yu Ting Shah. Tokyo Imp. Univ. *Proc. Imp. Acad (Japan)* 4, 410–2(1928).—Chloride is eliminated practically only through the glomeruli, while all the other inorg. constituents (K, Ca, Mg, SO_4 and PO_4) are eliminated from both the glomeruli and the tubules. **II. Organic substances.** K. Tamura, Fusao Fukuda, Gyokujo Kihara, T. Fujita and Seizo Komatsubara. *Ibid* 413–4.—Such org. constituents as urea and uric acid are eliminated partly from the tubules but mainly from the glomeruli. The glomerular filtrate is concd. into the urine, not only by reabsorption of fluid in the tubules but by elimination from them of urinary substances. C. J. West

Chemical study of the waters of Argyle Lagoon (Blalock, *et al*) 14.

12—FOODS

F. C. BLANCK AND H. A. LEPPER

A new constant for the analysis of butter fat and its substitutes. E. Tchétchéroff and N. Charliers. Lab. Intercommunal de Bruxelles. *Chimie et industrie* Special No., 832–3(April, 1928); cf. *C. A.* 22, 2676.—The method described by Kuhlman and Grossfeld (*C. A.* 20, 2373) is described, and the results obtained on a large no. of samples of butter fat are compared with those of the Kirschner and Leffmann-Beam methods. For detecting adulteration, it agrees fairly well with the Kirschner no. detn., but shows considerable divergence from the Leffmann-Beam no. It is easier and simpler to carry out than the Kirschner no. detn.; but has the serious drawbacks of necessitating a blank, which increases rapidly with the time of heating for sapon. A. P.-C.

Does the cooling of cream to a low temperature have a detrimental effect on the odor and flavor of butter? W. van Dam. *Vereenig. Exploitatie Proofzuivelboerderij Hoorn* 1926, 153–6; *Chem. Zentr.* 1927, II, 1106.—Comparative tests in which the cream was cooled for about 21 hrs. to a few degrees above 0° before souring showed no detrimental effect. J. S. Reichert

The lipolysis of worked butter several days after preparation. Otto Gratz. *World's Butter Review* 2, Nos. 7–8, 21–2(1928).—Bacteria develop most rapidly on the outer layer of the butter. In several expts. with mixed butters, it was found that there was a greater acid content when the outer layer was not removed. When the outer layer was removed before working the butter, the fat splitting in the inner part was not nearly so great in the same period of time. In these expts. the butter was stored 1–14 days before it was worked. The no. of lipolytic bacteria and the activity of their enzymes will decide the degree of fat-splitting that will occur. The highly lipolytic *Oidium lactis* and fat-splitting fungi ought to decide the issue here. As a rule the fat-splitting is not influenced to any degree during the first 14 days by mixing the outer and inner parts. After this period, however, it may have an effect in influencing lipolysis in some cases. If the outer and inner parts are mixed together, other component parts of the butter suffer change and decompn. and this, therefore, influences the taste and quality. J. C. Jurrjens

Margarine in the light of modern nutrition. F. DANNMEYER. *Volksernährung* **2**, 193–5; *Chem. Zentr.* **1927**, II, 1219.—A discussion concerning the absence of vitamins in margarine, and the possibility of adding vitamin D artificially. G. SCHWOCH

Difficulties in connection with the inspection of milk. ALFRED WEICH. *Oesterr. Chem.-Ztg.* **31**, 117–21(1928).—This pertains mostly to conditions in Austria. J. C. JURRJENS

Determination of the value of milk by quality. K. ZEILER, H. BAUER AND A. BERWIG. *Milchwirtschaft. Forsch.* **5**, 557–662(1928).—Data are given on the use of the following tests to det. the value of milk: sediment, condition of can, reductase test, fat content and acidity. GEORGE R. GREENBANK

Iodine content of milk powder. DON R. MATHIESON. Univ. of Minnesota. *Proc. Soc. Exptl. Biol. Med.* **25**, 826(1928).—Samples of powdered whole milk and of lactic acid milk from Indiana (goitrous region) were found to contain 166 and 44 parts of iodine per billion; these values may be compared with 62 parts per billion (dry basis) for milk from Berne, Switzerland (goitrous region) and 400 parts per billion for milk from the California coast where the feed was bathed by sea-spray (non-goitrous region). C. V. B.

Determination of dry gluten by the flask method. F. MARION. *Chimie et industrie* Special No., 824–5(April, 1928).—See *C. A.* **21**, 2339. A. PAPINEAU-COUTURE

New method for the volumetric determination of proteins in milk. AL. JONESCO-MATIU AND C. V. BORDEIANU. Univ. de Jassy. *Chimie et industrie* Special No., 826–30(April, 1928).—See *C. A.* **22**, 3463. A. PAPINEAU-COUTURE

The influence of different sugars on the flora of milk and cheese. WILHELM BAADE. *Milchwirtschaft. Forsch.* **5**, 375–405(1928).—The effects of dextrose, sucrose and lactose on the flora and products formed by the bacteria were studied. GEORGE R. GREENBANK

Cereals and the agricultural-chemical industries which depend upon them. FRANCESCO SCURTI. *Atti II congresso naz. chim. pura applicata* **1926**, 317–26.—A description, with special reference to the *alc.*, *beer*, *bread*, *starch*, *dextrin*, *glucose*, *corn oil* and *fodder industries*. Expts show that *rice husks* are composed of about 50% cellulose and 20% pentosans. Distn. with 30% H_2SO_4 yields about 4–5% *furfural*, 11% *AcOH* and 65% of a carbonaceous residue suitable for a fuel. With conversion of the cellulose into *EtOH* and the hemicellulose into furfural, rice husks should offer the means of a profitable industry. Though under ordinary conditions, cellulose has no nutritive value, this is only true when it is united chemically with hemicellulose. If cellulose is freed from its complexes, it becomes perfectly assimilable and can produce as much fat as can com. pure starch. Since *wood* is a product of the synthesis of cellulose complexes, it also offers a potential source of valuable products, particularly *sugars*. Expts. on the *hydrolysis of corn cobs* by dil. mineral acids and alkalies under different conditions of temp., pressure and concn. show that with acids under pressure, cellulose and hemicellulose are first formed, followed by further hydrolysis to sugars, including glucose, arabinose and xylose. Since *pure cellulose* is assimilated by animals, such treatment offers a means of producing a *fodder from wood*. Straw, grape vines and hemp stalks were also readily hydrolyzed to cellulose and sugars. This process has already been tried industrially, the products being *cellulose paste* and a *molasses*. C. C. DAVIS

Investigation of the relation between the quantity of milk and the fat content. WLODZIMIERZ SZCZEKIN-KROTOW. Landwirtschaftl. Hochschule, Warschau. *Roczniki Nauk Rolniczych I Lesnych* **15**, 494–501(1926); *Chem. Zentr.* **1927**, II, 2481.—The fat content of milk depends not only upon the quantity of milk, but also upon the state of lactation. Contents of 2.2–5.3% were found, the most frequent content being 3.3%. Milk with less than 3% fat cannot therefore without further investigation be regarded as adulterated. C. C. DAVIS

The calcia milk of Moll. FRITZ GERNSHEIM. *Münch. med. Wochschr.* **74**, 1184–6; *Chem. Zentr.* **1927**, II, 1410.—A description of the prepn. of a curative food from milk with the addition of Ca lactate for treating acute dyspepsia. The prepn. is not only as valuable as the original milk albumin of Finkelstein but excels in many respects. J. S. REICHERT

The origin of saltpeter rinds in cheese. F. W. J. BOEKHOUT, W. VAN DAM AND J. VAN BEYNUM. *Vereenig. Exploitatie Profzuivelboerderij Hoorn* **1926**, 1–14; *Chem. Zentr.* **1927**, II, 1106.—Characteristic, mostly brownish red to greenish yellow rinds, 0.25 to several cm. deep, ran parallel to the nitrite (produced by the added saltpeter) content. Bacteria which reduce nitrate to nitrite were isolated. By the action of

nitrite on casein N_2 and CO_2 are formed. The coloring matter in cheese showed no evident influence. J. S. Reichert

A simple method of ascertaining whether a flour answers the official requirements. Stefano Camilla. *Giorn. farm. chim.* **76**, 341–6(1927); cf. *C. A.* **22**, 3239.—With a 10% content in soy-bean flour the crumb of bread from 85% flour has a yellowish tint, that from 75% flour a brownish tint. Mary Jacobsen

Flour improvement without the use of chemicals by the method of D. W. Kent-Jones. J. Spousta. *Chem. obzor.* **3**, 230–1(1928).—The flour was heated in a sealed tin box to 82° for 10–12 hrs. and then added in various quantities (from 0.7 to 10%) to the original untreated flour. The baking tests carried out with these mixts. did not show (contrary to the results obtained by D. W. Kent-Jones) any improvement of pastry products and no increase in vol. was observed. Jaroslav Kučera

Flour bleaching. III. Process of Thomas-Humphries. J. Spousta. *Chem. obzor* **2**, 65–9; *Chem. Zentr.* **1927**, II, 988.—S. discusses the process of Thomas-Humphries, the feature of which is that certain metallic salts in an org. form (the compn. is not given) are sprayed into the flour. The results of baking tests are given (Czechoslovakia). The results are fluctuating and not always satisfactory. G. Schwoch

Flour bleaching. IV. J. Spousta. *Chem. obzor* **2**, 161–4; *Chem. Zentr.* **1927**, II, 988–9; cf. preceding abstr.—The Greffenius, the Dollinger and the Bleichster processes are used. All 3, however, are copies of Alsop's process. The flour bleached according to the 1st process was lighter in color than unbleached flour; other differences were not observed. The bleached flour has lost its so-called "wholesome appearance." A so-called sterilization is out of the question. As to the 2nd process, the color of the bleached flour was lighter, but the circumference of the pastry baked from it was smaller. G. Schwoch

The baking power of wheat flours and possibilities of its determination. E. Berliner and J. Koopmann. *Z. ges. Muhlenwesen* **4**, 119–25; *Chem. Zentr.* **1927**, II, 2785.—The ash of wheat is approx. 2%, of the lightest flour 0.3%, of bran 5%. The % compn. of the ash of wheat is P_2O_5 50, K_2O 30, MgO 10, CaO 5. With increase in the degree of milling the P_2O_5 increases most rapidly, the CaO least so. The components of the ash are apparently present in org. combination, with no prospect of partial enrichment by fertilization. The inorg. salts, chiefly phosphates, which are present in aq. solns. of flour and in dough originate from hydrolytic enzymic processes, and are of great importance in the behavior of leavened dough. Titration in steps is superior to simple acid titration for the electrolytic characterization of the flour. A good baking requires a sp. optimum p_H value of the dough, which is controlled by the character of the flour and of the baking and depends upon the buffer power. C. C. Davis

Iodine evaluation of grain flour. T. Chrzaszcz and W. Michalski. Poznan Univ. *Przemysl Chem.* **12**, 342–9(1928).—Exts. of rye and wheat flours absorb I_2 in a quantity dependent on the kind and content of sol. carbohydrates of the flour, especially the dextrins. The more dextrins of medium mol. wt. there are in the flour the more I_2 is absorbed. Since the dextrin content characterizes the degree of grinding, manner of preservation and ripeness, as well as conditions of reaping, the I_2 absorption of a flour gives a new basis for rapid evaluation of the properties of a flour and of its baking value. A. C. Zachlin

A comparative study of the glutelins of the cereal grains. Ralph K. Larmour. Univ. Minnesota. *J. Agr. Research* **35**, 1091–1120(1927).—Alkali-sol. proteins were prepd. from such cereal grains as wheat, rice, corn, oats, einkorn, emmer, durum wheat, teosinte, rye and barley. Analyses for N distribution by the Van Slyke method revealed a well-marked relationship between the various prepns., especially in respect to the basic N fraction. Glutenin of wheat and oryzanin of rice, both well-defined glutelins, occupy positions at the extreme opposite limits of the class in respect to ammonia N and total basic N, and the corresponding values for the other proteins described fall within these limits. This is submitted as evidence that the prepns. obtained belong to a definite class of proteins, the glutelins, which is represented in all the cereal grains thus far studied. A bibliography of 44 references is appended. W. H. Ross

Correlation of kernel texture, test weight per bushel and protein content of hard red spring wheat. J. H. Shollenberger and Corinne F. Kyle. U. S. Dept. Agr. *J. Agr. Research* **35**, 1137–51(1927).—Data from 1200 representative samples of hard red spring wheat were studied by gross, net and multiple linear correlation methods and by multiple curvilinear methods to det. the relationship of kernel texture, test wt. and protein content. A fairly strong tendency was noted for protein content to increase as the percentage of dark, hard and vitreous kernels increased. This relation was

curvilinear in character and was pronounced in the samples having a high percentage of dark, hard and vitreous kernels. A significant correlation was found between test wt. and protein content. The tendency was for protein to increase as the test wt. increased in wheats weighing less than 54 lbs., but in wheats weighing more than 54 lbs. the tendency was for protein to decrease as the test wt. increased. Forty-four % of the variation in protein was found to be due to the combined influence of these two grading factors. Kernel texture, however, was considerably more important than was test wt. A method is presented for estg. the protein content when the kernel texture and test wt. are known. No correlation was found between test wt. per bushel and kernel texture. W. H. Ross

Soluble carbohydrates in rye flours and evaluation of thickness of dough. T. Chrzaszcz and W. Michalski. Poznan Univ. *Przemysl Chem.* **12,** 389–402(1928).—Fresh normal flours are characterized by the approx. relationship of 1:1 between simple sugars (which reduce Fehling's soln. directly) and the complex sugars (which reduce Fehling's soln. only after inversion). During good storage this relationship may be shifted to 1:2 or even to 1:3. Poor damp storage causes an increase in sugar and decrease in dextrin content. The baking quality of flours was evaluated on equal working of the dough of const. consistency which was detd. with the aid of a cylinder 1 sq. cm. in cross section and weighing 90 g. suspended from the arm of a balance and submerged to 1 cm. in the dough. When uniformity of the flours was accomplished it was found that the dark flours gave better raising and yield of bread than the light flours. Effect of storage proved to be better on the dark than on the light flours. A. C. Zachlin

Seed kernels of Pinus pinea L. Angelos D. Maranis. Univ. Athens. *Arch. Pharm* **266,** 121–2(1928).—Examn. of the kernels was undertaken in order to det. their food value, the prevailing popular opinion being that they are very nutritious. Their most important constituents are: H_2O 4.88, ash 1.20, oil (extn. by CS_2) 51.50, N substances 37.45, carbohydrate 4.80%. The yellowish oil consisted principally of liquid acids (oleic) 95%, and solid acids (stearic) 5%. The following consts. were detd.: d_{15} 0.92134, solidification pt. $-21°$, n_D^{40} (Zeiss) 61, acid no. 4.19, sapon. no. (Köttstorfer) 192.22, I no. 119, Hehner no. 96, Reichert-Meissl no. 0.22, Polenske no. 0.35, ester no. 188.03. W. O. E.

The stable soy meal, a future human food H. Wastl. *Chem. Rundschau Mitteleuropa Balkan* **4,** 93–6; *Chem Zentr.* **1927,** II, 1105.—Reference is made to the high nutritive value of soy meal stabilized in a particular manner. J. S. R.

Purine bases in soy beans and flour. V. Ducceschi. *Arch. sci. biol.* (Italy) **12,** 181–4(1928).—The probability that the soy bean will play an important part in the national alimentation of Italy, led D to det. quantitatively the total purine bases in the seed and flour. Using the Kruger and Schittenhelm method he found: soy bean undried contains 0.173 and dried 0.191% purine bases; in defatted but undried flour 0.205% and in defatted and dried flour 0.233%. In spite of the high proportion of protein substances present in soy beans, the purine content is only slightly higher than that of other leguminous seeds. Peter Masucci

In what way does the quantity of sodium chloride influence the fermentation of dough when pressed yeast is used and when bottom beer yeast is used? Staiger and M. Glaubitz. *Brennerei-Ztg.* **44,** 150; *Chem. Zentr.* **1927,** II, 2019–20.—As the concn. of the NaCl increases, its influence upon both kinds of yeast becomes unfavorable. With pressed yeast an appreciably bad effect is evident only with a concn. of 3% or higher, and with beer yeast with a concn. of 2% or higher. Bottom beer yeast is useless in the baking industry. C. C. Davis

Natural and chemical leavening agents used in the baking process. Karl Schmorl. *Z. ges. Muhlenwesen* **4,** 74–6; *Chem. Zentr.* **1927,** II, 1313.—A discussion of employment and mode of action of yeasts; different kinds of natural yeast; fermentation; influence of temp., stimulants, and nutrients on the growth of yeast; examn. of yeasts; acid and alk. powders; mixing and differences in compn. of baking powders. G. S.

Baking yeasts from the factories of the Polish Republic. W. Iwanowski and J. Dembin. Polytech. Warsaw. *Przemysl Chem.* **12,** 349–67(1928).—This is a survey of the Polish yeast industry and a comparison of the yeasts of Polish manuf. with those of German manuf. There are 18 yeast factories in Poland with a potential capacity of about 25,000 tons yearly; 15 of these are active and produce about 7410 tons yearly. The rate of consumption of yeast is increasing. Chem. and biological tests are made on samples of yeast sent to a central testing lab. maintained by an assocn. of manufacturers. Numerous tables present the data. Polish yeasts are

found to last about 50 hrs.; time for raising dough 90 min. The German yeasts are reported to have 96–144 hrs. and 70–89 min. for corresponding values. A. C. Z.

Contributions to the analysis of cacao. PETER BERGELL AND LUDWIG FRESENIUS. *Z. med. Chem.* **5**, 61–2; *Chem. Zentr.* 1927, II, 1412.—In consideration of the observations of Rohrbach on the dietetic value of cacao deposits the authors recommend the investigation of the physical and chemical consts. of cacao since they have a bearing on its dietetic value. In the analysis of cacao the presence of decomposed cacao should be detd. This is best accomplished by detg. the p_H value on suspensions both in the cold and when hot. The total number of microscopic particles should be detd., the colloidal condition of a definite quantity of these particles should be studied, etc. J. S. REICHERT

The analysis of fruit and apple jams. ED. LASAUSSE. École de médecine, Nantes. *Ann. fals.* **21**, 346–7(1928).—Polemical with Muttelet (*C. A.* **21**, 3688; **22**, 828, 2012). A. PAPINEAU-COUTURE

The identification of artificial coloring matter in fruit juices and similar products. A. DE KROES AND A. RECLAIRE. *Chem. Weekblad* **25**, 525–8(1928); cf. *C. A.* **21**, 1852.—The usual reactions for coal-tar colors have been tried on a large no. of fruit juices. Most vegetable colors give a more or less colored thread after a single deposit on wool, but after a secondary treatment the chances of drawing a wrong conclusion are considerably less, although there are some vegetable colors that color wool after a secondary treatment. The AmOH test in ammoniacal soln. gives very good results, but experience has shown that several vegetable colors dissolve in AmOH. With the Caseneuve test, several vegetable colors give yellow filtrates instead of colorless ones. This test is suitable in cases in which both the AmOH test and the wool test of Spaeth lead nowhere, as for example with chlorophyll and Spanish pepper. Other methods of identifying coal-tar colors in fruit juices, etc., give results that are just as little reliable. J. C. JURRJENS

Utilization of the by-products of the cider industry. GASTON MALET. *Chimie et industrie* Special No., 781–4(April, 1928).—A discussion of and plea for the utilization of apple by-products. A. PAPINEAU-COUTURE

The problem of the use of lactic acid in the canning industry. HANNIS ECKART. *Konserven-Ind.* **14**, 457–9, 470–1; *Chem. Zentr.* 1927, II, 2360.—In ordinary concn. lactic acid has no bad corrosive action on Cu and Ni canning materials. For acidification it is not inferior to citric acid or to tartaric acid. C. C. DAVIS

Studies in home canning. I. Some factors affecting the keeping qualities of vegetables and meats canned by the hot water bath method. GERTRUDE SUNDERLIN, P. MABEL NELSON AND MAX LEVINE. Iowa State College. *Iowa State Coll. J. Sci.* **2**, 189–212(1928).—Spoilage records on 2732 pint cans of vegetables and meats are reported. The foodstuffs canned include: asparagus, beans, sweet corn, chard, tomatoes, beef and pork. The investigation included the effects of: previous history of foodstuff, precooking, delay in packing, duration of cooking, kinds of caps and rubbers, consistency of pack and storage. **II. Indices of spoilage in home canned foods.** *Ibid* 287–311.—The indices of spoilage on 615 jars of spoiled canned foods are presented. The criteria of spoilage include: (physical) appearance, odor, suction when seal is broken; (chemical) total acidity, p_H, and formol titration; and (bacteriological tests), microscopic examn., plate count at 37° and at 20° and growth in dextrose fermentation tubes. No one group of tests was conclusive but the physical evidences were most frequent indices of spoilage. It is best to use all three groups of tests. Change in odor was the best single test and formol titration and suction on breaking the seal ranked lowest. The paper includes 65 references and a brief digest of the literature since 1911 by years. F. E. BROWN

Are metal receptacles suitable for storing liquids in the beverage industry? ERICH WALTER. *Getränke-Ind.* 1927, 138–9; *Chem. Zentr.* 1927, II, 2124.—Expts. show that vessels made of Al, Fe, Zn, Sn and Cu are in principle unsuitable for storing or transporting beverages, since enough metal to affect the flavor is dissolved. Vessels made of V2A steel were without influence on the flavor. C. C. DAVIS

Preliminary conservation of fruit products without chemicals. H. SERGER. *Konserven Ind.* **14**, 469–70; *Chem. Zentr.* 1927, II, 2360.—Preliminary conservation may be obtained by sterilizing, by self-sterilizing of the material, or by chem. preservatives; the latter method is less desirable. After conservation in the so-called *Finckh* pots, vitamins A and C were still strongly present; B was much impaired, but not entirely destroyed. G. SCHWOCH

Urea in mushrooms. NICOLAI N. IVANOV. *Biochem. Z.* **192**, 36–40(1928); cf. **21**, 2018. S. MORGULIS

Nutritive value of mushrooms Cantharellus cibarius. J. Bareš. *Chem. Listy* **21**, 477–84(1927); cf. *C. A.* **22**, 254.—Mushrooms contain 9.58% of dry matter, of which 12.85% is ash and 3.50% is N, present partly as digestible protein, but to a large extent as chitin. Carbohydrates are present to the extent of 32.7%, chiefly as *d*-mannitol, sorbitol, dextrose, trehalose, cellulose and pentoses, other carbohydrates also being present. The nutritive value of mushrooms is small. B. C. A.

The toxicity of certain mushrooms. Chrétien and Leblois. *Rev. pathol. comp. hyg. gén.* **28**, 131(1928); *Bull. soc. hyg. aliment.* **16**, 253–4(1928).—Expts. were carried out on dogs. *Amanita muscaria, A. pantherina* and *spissa*, which had been dried at 38°, were found to be non-toxic. *A. citrina* which had been dried at 38° was slightly toxic when ingested in large quantities. Blanching with H_2O or with dil. AcOH destroyed the toxicity, and the H_2O or AcOH used for blanching showed no toxicity. *A. citrina* showed no toxicity after drying at 80°. *A. phalloides*, either raw or dried at 80°, is distinctly toxic; blanching in H_2O or in dil. AcOH removes the toxic principle, which passes into the blanching water but is destroyed when AcOH is used. A. P.-C.

Dry substance and starch content of potatoes by specific weight determination. Stan. Reynaert. *Natuurw. Tijdschrift* **10**, 117–24(1928).—Increasing sp. wt. of potatoes is accompanied by increasing dry substance, *i. e.*, mainly increasing starch content. Three practical household methods for agricultural use are described for detn. of the sp. wt. A table is added with sp. wt. as a function of dry matter and starch content. B. J. C. van der Hoeven

The action of phosphatide preparations. R. Rosenbusch and G. Reverey. *Margarine-Industrie* **1927**, No. 17: *Chem. Zentr.* **1927**, II, 2363.—A special device, is described in which in a reproducible way, the process of frying is imitated in a pan and the spurted fat collected on a coat of filter paper. Portions of 50 g. margarine were treated in the pan for 3 min. Margarine alone gave a loss through spurting of 4.95%, margarine contg. 0.1% *vitamargin*, a phosphatide prepn., lost only 0.46%. Contrary to Rewald, the alc.-insol part was found to be just as active as the alc.-sol. part. With 0.2% vitamargin, the spurting was practically eliminated. G. Schwoch

Rice. G. Issoglio. *Giorn. farm. chim.* **77**, 7–11, 33–42(1928).—Production, compn. nutritive value, vitamin content, the utilization of bran and polishings are discussed. In the province of Vercelli a bread with 5% rice flour is made which is equiv. to full grain bread. The utilization of rice bran made Italy fairly independent of the German supply of medicinal P compds. (phytin products). M. J.

The salmon of the Far East and its chemical examination. B. Pentegov, S. Georgievskii and U. Mentov. Univ. Vladivostok. *Labor. Allgem. Physik. Techn. Chem. Staatl. Univ. fernen Ostens* **1927**, 97–102; *Chem. Zentr.* **1927**, II, 2020–1.—Analyses of fresh salmon and of salmon salted in 3 different ways used in Russia and Japan are summarized. The I no. of the fat of the fresh salmon was 123, while the consts. of the fat from the salted fish varied greatly. C. C. Davis

Vinegar or lemon juice? M. Niermann. *Volksernährung* **2**, 260–2; *Chem. Zentr.* **1927**, II, 2126.—Lemon juice is not superior to vinegar in its acid properties, and in harmlessness they are the same. Lemon juice is, however, superior to vinegar as a source of vitamins and mineral substances. C. C. Davis

Industrial application of ozone in cold-storage plants. R. Capart. *Bull. assoc. élèves inst. sup. fermentations Gand* **29**, 369–73(1928).—Tests have shown that ventilation rapidly increases the no. of the bacteria through dispersion of the bacteria which brings them into more intimate contact with their food. Even when ventilation is practiced the bacteria are destroyed by O_3 at a rate which increases as the temp. falls (2 hrs. at 25°, 20 min. at 8°). The industrial application of these results in cold-storage plants is recommended and briefly discussed. A. Papineau-Couture

Present status of the molasses-feeds industry. M. Galland. *Chimie et industrie* **Special No.**, 821–3(April, 1928).—A brief review of recent progress and possible future progress of the industry. A. Papineau-Couture

Minerals in bovine feeding. H. H. Mitchell. Univ. of Ill. *J. Am. Vet. Med. Assoc.* **73**, 475–9(1928).—Discussion. Frances Krasnow

The vitamin content of silage fodder. Arthur Scheunert. Univ. Leipzig. *Z. Tierzüchtung Züchtungsbiol.* **8**, No. 3, 28 pp.; *Chem. Zentr.* **1927**, II, 2021.—An av. green silage fodder, prepd. according to the usual practice in Germany, contained vitamins A, B and C. Continued storage had an unfavorable effect on vitamin B. The vitamin C content of the stored fodder was lower than that of the fresh material. C. C. Davis

Industrial waste work of the sanitary district of Chicago [packing house waste] (MOHLMAN) **14**. *The toxicity of HCN (for rice weevil)* (ALLISON) **18**. The esterification of EtOH in citric acid *solution* (CORNWELL) **17**. *Lactic acid streptococcus* (DEMETER) **11C**. *I* as a biogenous element. XVI. The presence of I in feed (SCHARRER, SCHWAIBOLD) **11A**. Commercial caseins (FOUASSIER) **18**. *I* problem and exophthalmic goiter prophylaxis from the point of view of agricultural chemistry (SCHARRER) **11G**. Solubility of Cu in milk (SOLOMAN, QUAM) **2**. Shark liver oil (for use in food) (Brit. pat. 284,637) **27**. Apparatus for drying fruits or vegetables (U. S. pat. 1,686,500) **1**. Vertical column apparatus for drying grain (U. S. pat. 1,685,338) **1**. Apparatus for continuous mixing and delivery of "lard compound" (U. S. pat. 1,686,953) **1**. Apparatus for emulsifying milk powder, water and butter (Brit pat. 285,159) **1**. Removing incrustations formed from milk on hot metallic surfaces (Brit. pat. 284,778) **18**.

Food product. ISAIAH N ZELLER. U. S. 1,686,786, Oct. 9 A compressed mass is formed of layers of different kinds of dried fruits Each layer may be coated with chocolate or other coating.

Food product comprising pressed flakes of dried fruits. ISAIAH N. ZELLER. U. S. 1,686,785, Oct. 9.

Food fats. H. A. NEWTON. Brit. 284,368, Sept. 25, 1926. See U S. 1,601,229 (*C. A.* **20**, 3830).

Emulsified food. GLENN G. GRISWOLD. U. S. 1,686,556, Oct. 9. An emulsion is formed comprising honey 1 gal. and egg albumin 1 oz.

Flavoring material for foods. HERBERT T. LEO. U. S 1,686,670, Oct. 9. A non-hygroscopic flavoring is formed of cryst. dextrose together with natural fruit flavors such as fruit juices.

Soya-bean flour. GEORGE ALBERS. U. S. 1,684,654, Sept. 18. A flour proposed for use in preventing diabetes and also suitable for use as a substitute for casein as a glue is prepd. by comminuting soy-bean cake and drying to obtain a product contg. less than 10% moisture and fine enough to pass through a 72-mesh silk cloth.

Apparatus for applying cold air to flour during its milling or production. JEAN J. B. LOIZILLON. U. S. 1,687,300, Oct. 9. An app. is described in which material undergoing milling is subjected to currents of cold air, which produces a flour of improved quality for bread making.

Apparatus for pasteurizing milk in bulk. ERBY P. DAVIS, JAMES C. ROSS and MARTIN E. SMITH. U. S 1,686,227, Oct. 2.

Apparatus for deaerating milk. OLAF LARSEN (to The Creamery Package Mfg. Co.). U. S. 1,684,834, Sept. 18.

Drying milk. C KNOCH and F GROSS. Brit 285,313, July 21, 1927. Milk is evapd. *in vacuo* at a temp. below 60°, milk sugar and salts are sepd. by osmosis, the remaining concd liquid is transferred in the form of drops to steam-heated glass, china or like drums and the dried material thus formed is scraped off and compressed and may then be coated with the previously sepd. milk sugar and salts.

Milk preparation. GUSTAVE CHERBUIN-ROCHAT and ÉDOUARD JAUNIN. Fr. 635,798, June 11, 1927. Cream is sepd. from milk, the milk coagulated and the casein sepd., and sugar and the cream which has been sepd. are added. The cream and the casein-free liquid may be pasteurized.

Frozen egg product for food purposes. ALBERT K. EPSTEIN. U. S. 1,687,268, Oct. 9. Egg material is treated with an "edible acid" such as HOAc or citric acid to modify the viscosity of the material when frozen and to check decompn. after thawing. U. S. 1,687,269 specifies the addn. to egg yolk of salts such as NaCl or Na_2HPO_4 and an "edible acid" to give desirable viscosity and mobility after freezing and thawing. U. S. 1,687,270 specifies treating egg yolk with an "edible acid" such as H_3PO_4, HOAc, citric, tartaric, lactic or malic acid and with sucrose and NaCl to produce a product which when frozen and thawed has a viscosity less than if the sucrose and NaCl were not used.

Refining grain, meal and the like. ANTON S. POLLAK. Austrian 109,163, Nov. 15, 1927. The grain, etc., is treated with an atomized dil. soln. of H_2O_2.

Apparatus for drying cereals. SOCIÉTÉ D'EXPLOITATION DE BREVETS ET D'APPLICATIONS INDUSTRIELLES. Fr. 635,400, June 1, 1927.

Food from fish. A. EHRENREICH. Brit. 284,630, Feb. 1, 1927. The flesh of Plagiostomi and other marine fish is cooked with dil. HCl or other suitable dil. acid (suitably at 70–100°), free acid is neutralized with soda and the liquor is concd. *in vacuo* and may be dried.

Preventing blackening of canned fish foods. KOKICHI OSHIMA. U. S. 1,686,393, Oct. 2. Fish food to be canned is treated with a "regulating mixt." comprising NaCl together with a weak org. acid such as HOAc and a salt of such an acid, *e. g.*, NaOAc, to give a *p*H of 4–7 before canning and sterilizing.

Curing meat. EUGENE T. DRAKE (to Cudahay Packing Co.). U. S. 1,685,630, Sept. 25. A pickle for meat is prepd. by inoculating a series of cultures formed of an aq. soln. of a nitrate, sugar, salt and a protein material such as a meat-juice prepn. with bacilli or spirilli of non-putrefactive, non-pathogenic, nitrate-reducing, non-proteolytic, salt-tolerant character.

Gravies containing ingredients treated with ultra-violet rays. E. H. ERSLEV. Brit. 282,475, May 17, 1927.

Purifying pectin solutions. POMOSIN-WERKE GES. Brit. 284,273, Jan. 26, 1927. Substances producing turbidity in pectin solns. (such as starch decompn. products which resemble dextrin, albumins and the like) are removed by cooling the solns. (suitably below 0° somewhat for 3–4 hrs.) and sepg. the ppt. and ice formed.

Fruit juices. SOCIÉTÉ DES ÉTABLISSEMENTS BARBET. Fr. 32,711, July 8, 1926. Addn. to 615,942. A very high vacuum is employed in the evapg. tank to obtain concd grape or other fruit juices with sepn. of glucose by crystn.

Fruit and vegetable juices. FRED W. MANNING. U. S. 1,686,095, Oct. 2. Juices are expressed from apples, grapes or other fruits or vegetables through a body of treating solid such as kieselguhr, cotton fiber or asbestos continuously moved over a filter wall. An app. is described U. S. 1,686 096 specifies removing the juices from disintegrated fruits or vegetables in the absence of air. An app. is described.

Purifying fruit juices, wort, etc. MAX HAMBURG. Austrian 100,011, April 15, 1927. The juice or wort is treated with an oxidizing agent or with a weak elec. current, filtered, and then treated with a proteolytic enzyme.

Preservative coating on fruits and vegetables, etc. GEORGE W. BEADLE (to The Cellacote Co.). U. S. 1,685,392, Sept. 25. A homogeneous coating of hydrated cellulose is applied in liquid condition, *e. g.*, by use of a compn. prepd. from viscose, partially coagulated, *e. g.*, by $(NH_4)_2SO_4$ soln., and then further coagulated by treatment with acid; the coating is then treated with a substance such as NaOH soln. which will neutralize the acid and dried to cause the coating to shrink and exert pressure on the article which it surrounds. U. S. 1,685,393 relates to enclosing pineapples or other fruits or vegetables or eggs in a tight bag-like covering of material such as hydrated cellulose which is tightly fitted to the article in moist condition and then caused to contract on the coated article.

Beverages. J. A. FINLEY and C. P. WILSON (to Calif. Fruit Growers Exchange). Brit. 284,278, Jan. 27, 1927. Beverages are made by dilg. with water a mixt. of a colloid such as pectin, agar, gum tragacanth or gum arabic with fresh, dried, malted condensed or other milk and juices such as those of citrous fruits. The mixts. may be spray-desiccated.

Coffee extract. FRANK L. SLOCUM and WILLIAM E. TROUTMAN (to Magic Coffee Co.). U. S. 1,687,112, Oct. 9. Water is percolated through roasted ground coffee, successive fractions of percolate are collected, and these fractions are used successively to percolate a fresh portion of coffee. An app. is described.

Acid composition suitable for use in making foods or confections. HERBERT T. LEO U. S. 1,686,703, Oct. 9. A non-deliquescent compn. suitable for use in making jellies, jams, bakery products or confections comprises dextrose with which is incorporated a normally liquid acid or acid soln., *e. g.*, H_3PO_4, lactic acid, HOAc or malic acid.

Preparing spinach and like vegetables for canning. WILLIAM E. THOMAS. U. S. 1,685,511, Sept. 25. The vegetable is wilted at the max. temp. (suitably about 70°) at which the formation of pheophytin from the chlorophyll would be insufficient appreciably to affect the natural color of the vegetable.

Food for animals. A. EHRENREICH. Brit. 284,339, Jan. 28, 1927. Cuttings or bodies of sharks or the like, after removal of the skin, liver, fins and other parts otherwise utilizable, are pulped and desiccated *in vacuo* and ground.

Fodder and foodstuffs. EUGEN MISLIN (to Joseph F. Daubek and Georg Daubek.) U. S. 1,685,004, Sept. 18. See Brit. 254,388 (*C. A.* **21**, 2514).

13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

Our natural resources in present and future. F. M. JAEGER. *Chem. Weekblad* **25**, 482–91(1928).—A lecture, illustrated with graphs, of material and energy resources of the world. B. J. C. VAN DER HOEVEN

New chemical advances in Germany. W. JASTRZEBOWSKI. *Przemysl Chem.* **12**, 252–5(1928).—A review of industrial applications of new synthetic processes. A. C. ZACHLIN

Preparation for progress. GEORGE D. BEAL. *J. Am. Pharm. Assocn.* **17**, 730–6 (1928).—An address. The value of chemical and pharmaceutical research to industrial progress is emphasized. Many specific examples are given. L. E. WARREN

By-products of chemical warfare. AMOS A. FRIES. *Ind. Eng. Chem.* **20**, 1079–84 (1928).—A brief outline of some peace-time achievements of the Chem. Warfare Service. Among others, they involve: protection of marine piling, combating the boll weevil, the development of suitable ship-bottom paints, safe fumigation, and the development of simple masks for public health service and for protection against industrial poisoning and against NH_3. W. H. BOYNTON

The W. Gibbs triangle and its use in technical calculations. R. LITVINOV. *J. Chem. Ind.* (Russia) **4**, 291–3; *Chem. Zentr.* **1927**, II, 2091.—A graphical method is described which allows the *prepn. of any desired mixt. from several other mixts.* C. C. DAVIS

Economic symposium on nitrogen. Introduction. WILLIAMS HAYNES. *Ind. Eng. Chem.* **20**, 1128(1928). **The new economic aspects of nitrogen.** JASPER E. CRANE. Lazote Inc. Co. *Ibid* 1128–30. **Synthetic ammonia.** E. M. ALLEN. Mathieson Alkali Works, Inc. *Ibid.* 1131–3. **Economic relationships between nitrogen and fertilizers.** H. R. BATES. Intern. Agr. Corp. *Ibid* 1133–9. **Economic status of the by-product coking industry with reference to the nitrogen situation.** C. J. RAMSBURG. Koppers Co. *Ibid* 1139–44. **The international nitrogen problem.** W. S. LANDIS. Am. Cyanamid Co. *Ibid* 1144–7. E. J. C.

What a pound of ammonia will do. A. G. SOLOMON. *Power* **68**, 439–40(1928).—A table shows values from —10° to 85° F. of *pressure* in lbs. per sq. in.; *vol.* as cu. ft. per lb.; *vapor density* as lbs. per cu. ft.; *heat content* of liquid and of vapor as B. t. u. per lb.; *latent heat* as B. t. u. per lb.; and *entropy* of liquid and of vapor as B. t. u. per lb. per ° F. D. B. DILL

The flash points of various organic solvents. DANIEL FLORENTIN. Lab. Municipal de Paris. *Ann. fals.* **21**, 345(1928).—The following values were found: ordinary MeOH —7° (750 mm. Hg), abs. EtOH —12° (750 mm.), 95% EtOH +11° (748 mm.), PrOH 21° (752 mm.), BuOH 40° (740 mm.), fermentation BuOH 32.5° (740), AmOH 46° (740), Me formate —12° (765), AcOMe —11° (750), AcOEt —3° (765), com. AcOAm 32° (750); iso-BuOAc 22° (749), spirits of turpentine (from the Landes) 38° (751), benzine —8° (751), Me_2CO —20° (751), white spirit (150–200°) 39° (758). Detns. were carried out in the Luchaire app. A. PAPINEAU-COUTURE

Modern industrial evaporation methods. ERNST BLAU. *Chem.-Ztg.* **52**, 561–2 (1928).—The heat efficiency of single-stage or multi-stage vacuum evaporators is comparatively low. A great improvement is effected by compressing the vapors from the first evaporator, so that the condensation temp. of the compressed vapors rises above the boiling temp. of the liquid to be evapd. Best results are obtained, if this pressure evapn. by turbo and steam jet compressors is combined with multi-stage evapn.; little cooling water is needed. II. *Ibid* 578–9.—The compression-evaporation method is well suited for the evapn. of org. and inorg. liquids such as milk, sugar solns., soda and potash liquors, etc.; 15–25 kg. of water is evapd. per kw.-hr. and 10–30 kg. for very acid solns. Of increasing importance is the production of distilled water, as potable water, for industrial uses and for high-pressure boilers. Multi-stage evaporators, steam-jet compressors, electric and steam turbo compressors are in use. In the production of distilled water, independent of heat power plant, the price of the current and coal is largely the determining factor for the method to be employed. The use of electric turbo condensers in the evapn. of salt water is of great advantage, especially if the dissolved salts are recovered. Multi-stage evaporators and plants with jet compressors are cheaper in construction than compression-evapn. plants; the latter, however, being more economical, compete successfully. R. D. B.

Principles for studying rectification of liquid mixtures. CZESLAW GRABOWSKI. Polytech., Warsaw. *Przemysl Chem.* **11**, 253–9(1927).—By using as an example a mixt.

of C_6H_6 and $C_6H_5CH_3$ equations are derived for detg. the compn. of the liquid rectified and left in the tank after a given run. Equations for heat exchange are given, and a graphical method of interpretation is presented. Cf. *C. A.* **21**, 3402. A. C. Z.

The acceleration of sedimentation from suspensions. J. Traube. *Metall u. Erz.* **24**, 497–8; *Chem. Zentr.* **1927**, II, 2698.—By the addn. of small quantities of "Sedax," a colloidal reagent, it is possible to bring about in a short time the clarification of the liquor. The clarifying agent (0.1% soln.) is added at the rate of 80–100 cc. per hr. C. C. Davis

Technical sedimentation analysis. III. F.-V. v. Hahn and Aug. F. Thölcke. *Kolloid Z.* **46**, 44–52(1928); cf. *C. A.* **17**, 1535.—The methods for the prepn. of ordinary materials before their analysis by sedimentation are examd. critically. In the sedimentation analysis of the polishing materials of tooth paste, the situation is complicated by the fact that particle sizes vary from 40μ to mol. The suspensoid properties of the tooth paste in distd. water were comparable to the surface tension effect of the paste. A uniform method of prepn. of the pastes for analysis could not be developed. Most of the pastes suspended in soap solns. With some a Soxhlet extn. with alc. followed by suspension in water was effective. With others a combination of the treatments was satisfactory. L. F. Marek

The adsorptive properties of filter aids. H. L. Olin, N. A. Skow and Louis Zapf. *Trans. Am. Inst. Chem. Eng.* **20**, 251–72(1927); cf. *C. A.* **21**, 3691.—Evidence is presented to show that various substances used as filter aids in clarifying and filtering colloidal solns. are adsorptive agents acting preferentially on colloidal particles of given kind. It is suggested, therefore, that effective filtration of colloids is dependent upon the presence of adsorptive substances in the slurry rather than upon the formation of a net or screen to remove the particles mechanically. H. L. Olin

Effect of pressure on fundamental filtration equation when solids are non-rigid or deformable. D. R. Sperry. *Ind. Eng. Chem.* **20**, 892–5(1928).—In previous papers (*C. A.* **11**, 2945; **16**, 130) S. derived expressions for pressure-filtration which reduced to $WP = (Q_1^2 - R_qQ^2)/(T_1 - R_qT)$, where $W = 2K/R\%$ (K = rate of deposition, R = resistance of solids to flow, and $\%$ = percent of solids in mixt.), P = pressure (a const.), Q and T represent a point on a filtration time-discharge curve, Q_1 and T_1 represent another point on the same curve where $T_1 > T$, and $R_q = Q_1/Q$. By means of this expression an analysis can be made of a const.-pressure filtration time-discharge curve for the WP value, by merely knowing the time and discharge value of 2 points thereon and the pressure. To det. the exponent of P another curve is needed made under a different pressure, other conditions being held const. By means of a mechanical filtration recording device (*C. A.* **20**, 1477) consisting of (*a*) pressure-vessel with necessary valves, air gage and agitator, (*b*) filter cell with upper and lower horizontal filter leaves, and (*c*) a mechanical discharge recorder, time-discharge curves were obtained from a certain mixt. for several different pressures. The WP value for each curve was computed from the above fundamental equation. If the solid were rigid and undeformable the curve from the WP values for each pressure (plotted on logarithmic paper) would be a straight line making an angle of 45° with the pressure coordinate, corresponding to an exponent of unity for P. If the solids are not rigid or are deformable the curve will be either a line that is not straight or one that makes an angle of less than 45°. If the line is not straight, then certain factors other than pressure enter into the proposition; but if the line is straight, the tangent of the angle which it makes with the pressure axis is equal to the exponent of P. The time-discharge curves, computation tables and logarithmic curves are given for tests carried out with 5 substances. For all substances studied the logarithmic curves for WP values are straight lines, their angles having tangents as follows: starch, 0.87; kieselguhr, 0.82; red color, 0.7; mason's lime, 0.525; and fuller's earth, 0.115. The fundamental filtration equation then becomes, in its approx. form, $Q = A\sqrt{WP^cT}$ (for const. pressure conditions) or $Q = P^cW/2M$ (for const. rate of flow conditions), where A = tangent of substance concerned (see above), c = exponent of P, and M = const. rate of flow. The computation of the WP value from a time-discharge curve can be made in 15 min., by using the fundamental filtration equation at first cited above, and the accuracy of the computation is that of a 20-in. slide rule. Attention is called to the varying effect of pressure in filtering different substances; *e. g.*, by increasing pressure 4-fold with fuller's earth, the gain in output was 11%, while with kieselguhr it was 244%. W. C. Ebaugh

A new fireproof process, for the recovery of volatile substances. Weissenberger. *Feuerschutz* **7**, 258–60; *Chem. Zentr.* **1927**, II, 2091.—An *app.* and other equipment are described which permit the recovery of volatile substances and solvents according

to the process of the firm of Cheminova, Berlin. The process depends upon the fact that superheated absorption liquids show with the corresponding volatile substances so great a lowering of the vapor pressure that ignition of the vapor no longer occurs. C. C. Davis

Even and continuous delivery of liquids and gases for semi-plant work. M. Grochowski. Polytech., Warsaw. *Przemysl Chem.* **12**, 402-6(1928).—The liquid in question is forced dropwise through a siphon immersed in one neck of a Wolff bottle from which it is forced by air pressure produced by water entering another bottle which is only partly filled. Regulated rate of inflow of water into this last bottle dets. the rate of delivery of the liquid under investigation. To deliver gas continuously at a desired low pressure it is driven together with the water from a suction pump into a large bottle in which the water level is maintained by an adjustable siphon overflow. The gas is continuously forced out of this bottle through a delivery tube. A. C. Z.

Flow of brine in pipes. Richard E. Gould and Marion I. Levy. Univ. Ill. Eng. Expt. Sta., *Bull.* **182**, 24 pp.(1928).—The Darcy formula for loss of head in the turbulent flow range in circular pipes is $h = f(4lv^2/d2g)$, where f is a friction factor which is a function of a ratio or modulus $dv\rho/\mu$, known as Reynold's no., where d = inside diam. in ft., v = av. fluid velocity in ft., sec., μ = abs viscosity and ρ = density in lbs./cu. ft. The object of this investigation was to det. the relation between f and Reynold's no. when com. $CaCl_2$ brine is circulated in standard wrought-iron pipe under conditions encountered in refrigeration practice. The exptl. line consisted of wrought-iron pipe 1.38 in. in diam. with return bend, 108 ft equiv. length. Tests were made with variation of d. and temp. of soln. and velocity of flow and measurements were made of corresponding pressure drops. On plotting log friction factors as ordinates against log Reynold's no. as abscissas a curve was obtained slightly lower than the mean curve established by other investigators for flow of air, steam, water and oil in clean steel and cast-iron pipes but parallel with it. H. L. Olin

Dehumidification of air. C. S. Keevil and W. K. Lewis. *Ind. Eng. Chem.* **20**, 1058-60(1928).—A brief discussion of partial dehumidification of unsatd. air by water-cooling, without first bringing the air to the satn. point. Emphasis is placed on the relations and their significance of the diffusion of both heat and vapor through the gas film on the surface. A diagrammatic and a mathematical representation are indicated. Exptl. data confirm the representations in the cases of low humidity and work is being done with conditions of high humidity, when computation methods become more involved. W. H. Boynton

Determination of moisture in steam by electrical conductivity. M. E. Fitze. Milwaukee Elec. Railway and Light Co. *Power* **68**, 484-5(1928).—It is assumed that entrained moisture in steam carries solids in the same proportion as boiler water. A calibration curve is obtained by collecting 2 l. of condensate, adding boiler water in increments of 2 cc., and detg. cond. with a Leeds and Northrup portable resistance meter using a portable dip cell. Cond. is plotted against % boiler water added. A second curve, drawn through the origin and parallel to the first shows the direct relation between moisture of the steam and cond. of the condensate. D. B. Dill

Mode of operation of steam and fire cooking in liquid containers. W. Redenbacher and J. Huber. *Arch. Wärmewirt.* **7**, 103-6(1926).—Some tests on over-all heat transfer rates were made on the cooling of mash and of *worts* of different strengths with water. For a 12.5% wort the rates are about 15% less than for pure water, while for 50% wort the rates are about 25% of those for 12.5% wort. Mash lies about half way between pure water and 50% wort. Ernest W. Thiele

Regularities in the technical plasticization of machined and molded materials. Otto Manfred and Josef Obrist. Physik. Inst. Techn. Hochschule Brunn. *Z. angew. Chem.* **41**, 971-7(1928); cf. *C. A.* **22**, 173.—A continuation of work on plastics and synthetic resins, in which the elastic properties of the materials are studied. The results confirm those previously published. J. H. Perry

The Ruths accumulator in chemical works. K. Schiebl. *Arch. Wärmewirt.* **8**, 379-83(1927).—Flow diagrams are given, showing the ways in which an accumulator was included in various steam systems, especially in *sugar works*. E. W. T.

Results obtained with a Ruths accumulator in a textile plant. H. Severin and Fr. Scupin. *Arch. Wärmewirt.* **8**, 369-74(1927).—A description of plant conditions before and after installation of the accumulator, which greatly increased production. Ernest W. Thiele

The technic of producing highly dispersed solids in ball mills. K. Bergl and J. Reitstötter. *Kolloid-Z.* **46**, No. 1, 53-5(1928).—Dispersion methods have superseded condensation methods in the production of colloids. Some of the proposed

dispersion methods are reviewed and emphasis is placed on the ball-mill method. An analysis is made of the mechanism of ball-mill grinding. Volatile, org. liquids may be used as dispersion media without danger of explosion, but the mechanism must be understood in order to regulate the speed properly to prevent free falling of the balls.

L. F. MAREK

Possible working substances for steam power plants. A. LOSCHGE. *Arch. Wärmewirt.* **9,** 75–9(1928).—The thermodynamic properties of H_2O, Ph_2O and Hg are examd. as to their suitability for practical working cycles between 450° and 20°. The theoretical advantages of Ph_2O are too small to outweigh the practical difficulties, but the Hg-H_2O combination is promising. ERNEST W. THIELE

Calculation of the most economical thickness of insulation. E. BORSCHKE. *Arch. Wärmewirt.* **9,** 117–20(1928).—A detailed mathematical discussion, including diagrams to aid in the solution of the equations arrived at. E. W. T.

The testing of insulators after pronounced fouling. HEINZ BECHDOLDT *Keram. Rund.* **36,** 241–3(1928).—For the simulation of fouling in use of high-tension insulators by rain-water, fog, salt spray, chem. ppts. and dusts a room was constructed in which insulators could be placed connected with high-voltage currents and observed through windows. Water and solns. of various salts, alkalies and acids were sprayed into the room. Deposits of metallic dusts gave a flash-over voltage of 3–4% of the normal value, salt deposits 10% of the normal value, soot and S 10–15%. Cement dust caused a flash-over at 20% of the normal voltage and street dusts about 80%. The shape of the insulator affected the results considerably. H. INSLEY

Observations on the properties of certain so-called thermal insulators. JOHN B. DUTCHER. Indiana Univ. *Proc. Indiana Acad. Sci.* **37,** 227–31(1927).—Two warm vessels, one covered with a single layer of asbestos paper and the other uncovered, were allowed to cool and the usual cooling curves were obtained. It was found electrically that 24% more heat was required to maintain the covered vessel at 80° than the uncovered vessel, the room being at 27°, and water being in each vessel. With 2 similar pieces of stove pipe, one being covered with a single layer of asbestos paper, it was found electrically that it required nearly 45% more energy to maintain a temp. of 140° with the covered pipe than the naked pipe. Thus a *thin* layer of a poorly conducting material increases the loss of heat. The increase in radiation resulting from the change in the nature of the exposed surface thus outweighs the insulating effect. Hence the use of a *thin* layer of asbestos on the grounds of heat economy is deceiving. S. L. B. ETHERTON

Systems of heating by superheated water. L. KLOTZ. *J. Chem. Ind. (Moscow)* **5,** 628–9(1928)—The system of heating employed in *Raschig's coal-tar distn. plants* presents many serious defects. The system is based on the principle that the lower sp. gr. of hot water will cause it to rise above the cold water and thus force the circulation of the former; as, however, the difference of sp. gr. between hot water and cold water is insignificant, the speed of circulation of hot water is very small and, on being still further reduced by the friction existing in the pipes (coil), the circulation is sometimes apt to cease altogether. Moreover, a special water superheater must be attached to every single distn. retort. The system of heating by means of the *circulation pump of Opitz and Klotz* is free from these defects. This pump forces the superheated water through the heating coil with comparatively great speed. As the heating effect depends on the rate of hot-water circulation, it is thus correspondingly increased. The speed of the superheated water being in the latter system independent of the temp., pipes and coils of any desired length can be used, and thus several retorts can be heated simultaneously by the use of the same pump. While the pump always remains cold, it may be used for heating with water superheated up to 400°.

BERNARD NELSON

Heat transfer in condensers. W. K. LEWIS. Mass. Inst. Tech. *Am. Gas J.* **128,** No. 3, 42–4(1928).—The cooling of gases contg. vapors which condense during the cooling process is considered. Steam-air mixts., of dew point of 180° F., were cooled to 220° F. with cooling water not higher than 120° F. at any place, and condensation of water was observed on the cooling pipes. Heat transfer coeffs. over 10 times the value which was expected were also observed. L. discusses this case theoretically and shows that the heat of condensation is not transmitted through the gas film on the pipes and should not be considered in calcg. the coeffs. The vapor passes through the film by diffusion and is condensed on the cold pipe surface. In calcg. the coeffs., however, the sensible heat of the condensed vapors must be considered as passing through the gas film and L. discussed the assumptions to be made here. Flow of oils in coolers and heaters is considered and the difference in power required

for pumping in both types is explained by the difference in viscosities of the hot and the cold films. M. C. ROGERS

Heat-transfer data for the scrubber designer. TED ROSEBAUGH. Pacific Gas and Elec. Co. *Chem. Met. Eng.* 35, 144–8(1928).—R. discusses the need for accurate data for designing gas scrubbers. Curves showing results of tests made on an exptl. plant under operating conditions are given. Water-satd. oil-gas of 550 B. t. u. was passed through 2 scrubbers, each packed with wooden grids. Data were taken for a wide range of conditions, and curves are presented which show the effect on the over-all heat transfer coeff. of (a) water rate, (b) gas velocity and (c) inlet gas temp. Other curves are given showing heat content of satd. oil-gas, crit. velocities of gas and air for various tray spacings, and such other data as are necessary for calcns. involved in scrubber design. M. C. ROGERS

The removal of hydrogen sulfide from industrial gases by means of alkaline ferricyanide. F. FISCHER AND P. DILTHEY. *Brennstoff-Chem.* 9, 122–6(1928).—Alk. solns. of $K_3Fe(CN)_6$ are tested for removal of H_2S as S from H_2 gas carrying known known amts. of H_2S. Factors detd. are: (a) effect of alk. concn. on S pptn. and amt. of $K_3Fe(CN)_6$ used in side reactions (formation of $K_2S_2O_3$, K_2SO_3 and K_2SO_4); (b) effect of alkali concn. and concn. of $K_3Fe(CN)_6$ on reaction velocity; (c) effect of concn. of the $K_4Fe(CN)_6$ formed on the efficiency of H_2S oxidation. The best removal of S (96.05%) was obtained with a 15% $K_3Fe(CN)_6$ soln. contg. 1 mole Na_2CO_3 × $^1/_3$ mole $NaHCO_3$ per mole $K_3Fe(CN)_6$. The S pptd. was 0.3135 g., requiring 6.450 g. $K_3Fe(CN)_6$, 3.95% of which was used in side reactions. Stronger Na_2CO_3 or added KOH increases the amt. of reagent used in side reactions. Concn. of $K_3Fe(CN)_6$ has no influence on its efficient utilization, but an enormous influence on reaction velocity. The S obtained is very pure. Electrolytic regeneration of the $K_3Fe(CN)_6$ soln. seems practical. For this purpose 3 kw.-hrs. should be required per kg. S produced. J. D. DAVIS

The use of dry chemical fire extinguishers in industrial plants from the standpoint of their effect on the user. W. ELSNER V. GRONOW. *Zentr. Gewerbehyg. Unfallverhüt.* 14, 161–6; *Chem. Zentr.* 1927, II, 723.—With proper use there is no danger to the health or safety of the user. CCl_4 can form $COCl_2$ with alc., wood fiber and Fe but is safe for garages, railroad trains, rubber and extn. plants. *Methyl bromide* and "saponin" extinguishers can at the most cause slight injury to health. J. S. REICHERT

Benzene poisoning as a possible hazard in chemical laboratories. J. J. BLOOMFIELD. *Pub. Health Repts.* 43, 1895–7(1928).—Air tests in several labs. using 3 to 5 gal. benzene weekly showed 28 to 223 p. p. m. Although exposure may be intermittent, the fact that benzene concns. exceeded the industrial safety limit of 100 p. p. m. was taken as a warning to exercise more care in the handling of benzene in chem. labs. The use of toluene, xylene and high-flash naphtha instead of benzene for washing and cleaning purposes whenever possible is recommended. C. M. SALLS

Lessening menace of benzene poisoning in American industry. ALICE HAMILTON. *J. Ind. Hyg.* 10, 227–33(1928).—The use of benzene has markedly decreased in the past six years, especially in the making of sealing compds. for sanitary tin cans, in the making of rubber goods, in dry cleaning, and in quick-drying paints; but is still generally used in coating patent leather, in certain rubber cements, and in paint and varnish removers. C. M. SALLS

Microscopic pathology attending exposure of guinea pigs to vapors of ethyl bromide. C. P. WAITE AND W. P. YANT. *Pub. Health Repts.* 43, 2276–82(1928).—High concns. of EtBr vapors in air (18, 14, 13 and 6%) are markedly irritating to the lungs when breathed for a short period, producing an acute congestion and edema. Low concns. of EtBr vapor in air (2.4, 1.2, 0.65 and 0.32%) act as a toxin to the kidney, producing a diffuse acute parenchymatous nephritis. C. M. SALLS

Medical supervision of lead industries. L. SCHWARTZ. State Hyg. Inst., Hamburg. *Z. Gewerbehyg. Unfallverhüt.* 15, 16–22(1928); *Bull. Hyg.* 3, 581(1928).—S. believes in temporary suspension of doubtful cases and alternation of employment. He would exclude from employment persons having albumin in the urine, exaggerated knee reflexes, arteriosclerosis and high blood pressure. A scheme of diagnosis is given. GEORGE R. GREENBANK

Gravimetric determination of dust inhaled by workmen. A. I. BURSTEIN. *J. Ind. Hyg.* 10, 279–91(1928).—An instrument called the koniogravimeter was devised to imitate the functioning of the human respiratory app. The dust is removed from inspired air by passing through a weighed filter made of glass wool and cotton and attached to the nose of the experimenter. A special plunger pump may also be used

to pull the air through the filter. The use of the term "dust coefficient" is suggested to signify the av. weight of dust inhaled by a workman during an hour. C. M. S.

Method of action of silica dust in lungs. PATRICK HEFFERNAN AND A. T. GREEN. *J. Ind. Hyg.* **10,** 272–8(1928); cf. *C. A.* **21,** 972.—SiO_2 in stable combination and cryst. SiO_2 appear to be harmless while in those states. The harmful effects of colloidal SiO_2 appear to be due to its powerful potentialities as a colloid. Pulmonary silicosis is probably caused by the colloidal action of hydrated SiO_2, formed from minute particles of SiO_2 dust disseminated through the pulmonary tissue. Substances that are known to coagulate colloidal SiO_2 will prevent its harmful activity in the lungs. Such substances are clay, carbon, shale dust, etc. C. M. SALLS

System for maintaining constant heating value per unit volume in gases (U. S. pat. 1,686,751) **1.** Insulating paper (Fr. pat. 635,236) **23.**

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WENZEL, O.: **Adressbuch der chemischen Industrie des deutschen Reichs.** Berlin: R. Mückenberger. 762 pp. M. 73. Reviewed in *Chimie et industrie* **20,** 597(1928).

Purifying gases. GEORG F. UHDE. U. S. 1,685,733, Sept. 25. See Brit. 250,963 (*C. A.* 21, 1320).

Purifying gases by adsorption. H. HOLLINGS, S. PEXTON, W. A. VOSS and GAS LIGHT & COKE CO. Brit. 284,758, Nov. 2, 1926. The contact chamber or its exposed surface is formed of material inert toward any constituents of a gas to be purified which otherwise might react to form metallic carbonyls. Cu, Zn or a refractory enamel may be used, and, in the case of coal gas or the like contg. impurities such as H_2S a material inert to such impurities is used. Preliminary purification may be effected for removal of any impurities such as carbonyls which may be present as by use of charcoal impregnated with chromates or dichromates or heated Cu. A filter of used adsorption material may be used for a preliminary removal of alk. liquid or metal particles.

Drying gases containing nitrogen oxides. I. G. FARBENIND. A.-G. Brit. 284,839, Jan. 1, 1927. The gases are treated with H_2SO_4 at a temp. of 30–100° and preferably under pressure (which may be 5 atm.). Such a quantity and concn. of H_2SO_4 are used that gases of a concn. of 60–65% are obtained and the gases may be treated with acid contg. N oxides so that the acid is denitrated.

Gaseous reactions. I. G. FARBENIND. A.-G. Fr. 635,619, June 8, 1927. Gaseous reaction products are purified as they come from the reaction chamber by passing them through or over substances such as SiO_2 gel, activated C or pumice, at a temp. only low enough to prevent any catalytic action. The method is applied to the purification of naphthoquinone from the oxidation of naphthalene, benzoquinone from benzene and its derivs. and BzH and BzOH from toluene. It is also applicable to decarboxylations and catalytic hydrogenations.

Catalytic reactions of gases. ROLAND E. SLADE (to Atmospheric Nitrogen Corp.). U. S. 1,686,349, Oct. 2. In effecting reactions such as NH_3 synthesis a stream of uncatalyzed gases is preheated by passing it in contact with a body of heat-storing material such as part of the catalyst itself and the gas stream is then passed through a body of catalyst to effect exothermic reaction progressing in the direction of flow of the gas and subsequently in contact with a second body of heat-storing material: periodically the flow is reversed to maintain proper temps. in the different portions of the app. (which is described).

Diffusion reactions between gases. HANS WALTER (to Verein für chem. Industrie A.-G.). U. S. 1,685,759, Sept. 25. Gases such as H and CO which react but slowly in simple mixt. are sepd. by a diffusion partition which may be formed of catalytically metallized asbestos and the gases diffuse into this partition and the product formed, *e. g.*, MeOH emerges from the partition under the diffusion pressure.

Separating gaseous mixtures with activated carbon. ARTHUR B. RAY (to Carbide and Carbon Chemicals Corp.). U. S. 1,685,883, Oct. 2. Water is supplied to active C to cool it during the absorption of gases such as gasoline from natural gas.

Treating gases with finely divided solids or liquids for adsorptions or various reactions, purifications, etc. METALLBANK UND METALLURGISCHE GES. A.-G. Brit. 285,038, Feb. 9, 1927. A tower is used in which particles suspended in gases are displaced upwardly (suitably in a chamber flaring toward the top so that gases introduced at the bottom have their velocity decreased as they ascend). This treatment may be applied to the recovery of gasoline by adsorption from natural gas, removing S from gases by purifying reagents, treating starch with HCl for saccharification, washing gases with atomized liquids, distg. phenols from NH_3 water, oxidation of atomized metals or oils with O, producing powders by cooling atomized molten material, effecting crystn. by cooling atomized solns. and in carrying out catalytic processes.

Fractional liquefaction and separation of constituents of gases. GES. FÜR LINDE'S EISMACHINEN A.-G. Brit. 284,213, Jan. 24, 1927. In sepn. by partial condensation of constituents of coke-oven gas or other gas mixt., a gas of low b. p. such as N, under pressure, is cooled by the main body of constituents condensing out, and subsequently expanded and liquefied, serving as a bath for the last condensation stages. Various details and an app. are described.

Separating liquids. THOMAS FISHER. Fr. 32,572, Nov. 24, 1926. Addn. to 592,129. The app. described in Fr. 592,129 is used for sepg. water from heavier liquids and for separating liquids in general of different sp. gr.

Pervious material for purifying liquids by filtration. ARTHUR SCHREIER (to General Zeolite Co.). U. S. 1,685,204, Sept. 25. Filter stone or sand or other suitable porous material is treated with a light-sensitive compd. of Ag such as $AgNO_3$ or a Ag halide and the material is then exposed to light and treated to produce a surface deposit of metallic Ag.

Mixing solids with liquids such as in water purification. WILSON EVANS (to National Aluminate Corp.). U. S. 1,686,076, Oct. 2. A continuous stream of finely divided solids is projected at high velocity against the surface of water or other liquid with which the solid is to be mixed. An app. is described.

Detecting and removing impurities in steam or water heating systems used in chemical operations, etc. T. DÜRST. Brit. 284,215, Jan. 24, 1927. In steam- or water-circulating systems such as those used for heating or treating materials used in the manuf. of cellulose, oils or soap, impurities leaking into the system are detected by continuously withdrawing a small quantity of water from the return pipe and collecting this sample in an observation vessel. An app. is described.

Use of jets of liquid such as water for detaching cellulosic or other similar molded cap-shaped bodies from their molds. EMIL CZAPEK and RICHARD WEINGAND. U. S. 1,687,282, Oct. 9.

Purifying and fractionating oils and ketones. A.-G. FÜR KOHLENSÄURE-INDUSTRIE AND E. B. AUERBACH. Brit. 285,064, Feb. 12, 1927. The process of purifying and fractionating mineral oils by use of liquid CO_2 as described in Brit. 277,946 (*C. A.* 22, 2660) is applied to the treatment of mixts. of mineral oils with other substances, and to fats and fatty oils, essential oils, resin oils, tar oils, terpenes and other liquid hydrocarbons and ketone oils. Several examples are given.

Ion-concentration control. IRVING B. SMITH and EARL A. KEELER (to Leeds & Northrup Co.). U. S. 1,684,645, Sept. 18. A potential difference, varying in magnitude with variations in ion concn., is magnified by mixing with the soln. contg. the ions involved a proportioned quantity of a substance such as an aq. liquid and the magnified potential difference is utilized to control the ion concn. of the unmodified soln., *e. g.*, by appropriate neutralization. An app. is described.

Crystallization of salts without evaporation. A. A. SHALABANOV and S. A. ROGINSKII. Russ. 4164, Sept. 15, 1924. A block of frozen salt soln. and salt crystals is broken up and introduced into a container with a soln. of the same salts. The salt ppts. on the bottom during the melting of the ice and is collected in a receiver and the dil. salt soln. obtained from the melting ice is continuously withdrawn from the upper part of the app.

Catalytic oxidation. MONSANTO CHEMICAL WORKS. Fr. 635,717, June 9, 1927. A gaseous mixt. of O and an org. or mineral substance is heated in the presence of V_2O_5 and pyrovanadates. The process is used for the prepn. of H_2SO_4, phthalic anhydride, BzOH, BzH, salicylic acid and aldehyde, formaldehyde and AcH.

Controlling the rate of oxidation of metallic sodium or other materials. HECTOR R. CARVETH (to Roessler & Hasslacher Chem. Co.). U. S. 1,685,520, Sept. 25. A

mixt. of alkali metal and inert material, both in finely divided form, *e. g.*, a mixt. of Na 10 and Na_2O 90% is used for reaction with O to form addnl. Na_2O or Na_2O_2. More Na is added as required. An app. is described.

Dispersions. J. R. Geigy Akt.-Ges. Fr. 635,859, June 7, 1927. See Brit. 272,896 (*C. A.* **22,** 1859).

Briquetting ores, etc. Malmbrickett Aktiebolaget. Brit. 284,418, Nov. 8, 1926. Briquets, *electrodes* and the like are made from a mixt. of crushed ore, carbonaceous material, limestone or quartz, and tar or molasses (or both), with or without a small quantity of salt and are dried at about 150–300° for 1–3 hrs.

Method and apparatus for gravity separation of ores or other materials with an agitated mixture of liquid and solid of intermediate specific gravity. Thomas M. Chance. U. S. 1,685,521, Sept. 25. Mech. features.

Treating the interior of pipes with cleaning and coating materials. Nicolaus Meurer (to Metallogen G. m. b. H.). U. S. 1,687,102, Oct. 9. The treating material is injected under pressure and an app. is described by which substantially the same pressure may be maintained throughout the length of the pipe under treatment.

Countercurrent filtration system for oil, sugar solutions or other materials. Fred W. Manning. U. S. 1,686,092, Oct. 2. Treating solids such as fuller's earth or bone char are introduced into a zone of air or other elastic fluid situated above the level of a liquid to be filtered, the solids are distributed throughout the liquid and the liquid is then filtered through the solids. An app. is described. U. S. 1,686,093 and U. S. 1,686,094 also relate to constant renewal of filtration material in continuous filtration processes and describe app. Cf. *C. A.* **21,** 144.

Conducting layer of high resistance. Siegmund Loewe. Fr. 635,291, May 13, 1927. A layer is made of a dry residue from a soln. of colloidal C obtained after addition of about 3% of a protecting colloid such as a stannic colloid.

Refrigerating apparatus. Alfred M. Thomson (to Joseph Mercadante). U. S. 1,684,810, Sept. 18.

Vacuum refrigerating apparatus. G. Thomas and P. Schlumbohm. Brit. 284,233, Jan. 25, 1927. Structural features.

Refrigerating system of the absorption type. A. Einstein and L. Szilard. Brit. 284,222, Jan. 24, 1927. A diagram of partial pressures for various concns. is given with MeOH used as refrigerant and octyl alc. used as solvent. Other solvents referred to include "higher molecular paraffins," isoamyl ether, and other ethers and esters of the "lower molecular compds." contg. OH or NH_2 groups such as glycol. $CHBr_3$ may be used in systems without special liquid pumps.

Refrigerating apparatus of the absorption type. A. Lenning (to Electrolux, Ltd.). Brit. 284,193, Jan. 22, 1927.

Refrigerating system of the absorption type. Baltzar C. von Platen and Carl G. Munters (to Electrolux Servel Corp.). U. S. 1,686,425, Oct. 2.

Refrigerating system of the absorption type. Baltzar C. von Platen and Carl G. Munters (to Electrolux Servel Corp.). U. S. 1,685,764, Sept. 25.

Refrigerating apparatus of the absorption type. Alfred Richter (to A.-G. für Handels- und Industrie-werte Glarus). U. S. 1,685,340, Sept. 25.

Refrigerating system of the continuous-cycle absorption type. Platen-Munters Refrigerating System Aktiebolag (to Electrolux, Ltd.). Brit. 285,016, Feb. 8, 1927. Structural features.

Refrigerating system of the reversing absorption type. Bayer Geb. Brit. 284,987, Feb. 7, 1927. Structural features.

Refrigerating system of the compression type. A.-G. Brown. Boveri, et Cie. Brit. 285,003, Feb. 8, 1927.

Refrigerating apparatus of the compression type. Akt.-Ges. Brown, Boveri, et Cie. Brit. 284,646, Feb. 2, 1927. Structural and elec. features.

Refrigerating apparatus of the compression type. E. H. Hull (to British Thomson-Houston Co., Ltd.). Brit. 284,729, Feb. 5, 1927. Structural features.

Refrigerating apparatus of the compression type. C. Steenstrup (to British Thomson-Houston Co., Ltd.). Brit. 284,730, Feb. 5, 1927. Structural features.

Electrical insulation containing natural or artificial resins. H. L. Watson (to British Thomson-Houston Co.). Brit. 284,232, Jan. 25, 1927. Tubes and spools for elec. app., or other molded articles, are made from kraft sulfate sheet wood pulp or similar cellulosic sheet material with felted fibers of natural length, impregnated with shellac, bakelite, glycerol-phthalic anhydride resin or the like.

Heat-insulating material suitable for use on pipes, in walls, etc. Warren M. Emerson (to Certain-teed Products Corp.). U. S. 1,687,285, Oct. 9. A dry mixt.

formed from calcined gypsum 400 lbs., a carbonate such as $NaHCO_3$ 4 lbs. 13 oz., $Al_2(SO_4)_3$ 10 lbs., a colloid, lime 1 lb. 12 oz. and an acid retarder, *e. g.*, oxalic acid 1 lb. 5 oz., is mixed with water.

Heat insulation on walls, etc. E. H. Wenzel. Brit. 284,849, Jan. 15, 1927. Finely divided dry material such as fragments of paper, wood fiber or corn stalks are projected on walls or other surfaces and caused to adhere to each other and to the surface by glue, waterglass or other glutinous adhesive which may be rendered vermin-proof by addn. of an As compd. or other suitable substance. An app. is described.

14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

Recreational use of watersheds of public water supplies. W. L. Stevenson and H. E. Moses. *Water Works* 67, 254–5(1928).—There has been a pressing demand to use watersheds of water supplies for recreational uses such as camping, fishing, bathing, etc., and one state has passed a law allowing this use of watersheds provided no trespass is committed. The riparian rights of owners of land abutting on water courses complicate this problem. Remedies which are suggested for safeguarding public supply watersheds against contamination through recreational use include zoning, placarding, sanitary control, education of the public and legislation. C. C. Ruchhoft

Contamination of well and collecting reservoir public water supplies. Harry F. Ferguson and Clarence W. Klassen. *Water Works* 67, 209–13(1928).—Instances of well and reservoir contamination in Illinois resulting from the following causes, surface contamination of well through open top, underground contamination of well, surface contamination of an open reservoir, surface contamination of a reservoir through defects in the cover and underground contamination of a reservoir, are described. C. C. Ruchhoft

Water-works practice. W. E. MacDonald, *et al.* *J. Am. Water Works Assocn.* 20, 381–9(1928).—Tabulated answers and percentages to questions of all kinds; 11% cities have phenol tastes, 45% have algae troubles. Many remedies are listed. D. K. French

Measurement of the quality of water. Jack J. Hinman, Jr. State U. of Ia. *Proc. Iowa Acad. Sci.* 34, 69–75(1927).—A review and discussion with bibliography appended. W. G. Gaessler

Time savers in water analysis. F. E. Daniels. *Public Works* 59, 213–5, 282–4(1928).—The routine practices of the lab. of the Pennsylvania State Board of Health in water analysis are described in detail. Individual counter weights for silica dishes, a method of fast weighing and a cabinet desiccator expedite the work. The app. and methods for the detn. of free and albuminoid ammonia, chlorides, nitrates, nitrites, total hardness, alky., color, odor, H ion, solids, Fe and O consumed are included. C. C. Ruchhoft

The determination of the residue on evaporation and of its loss on ignition. Horn. *Kl. Mitt. Ver. Wasserversorg. Abwässerbeseitig.* 3, 313–4; *Chem. Zentr.* 1927, II, 2334.—Detailed description of the detn. of the residue on evapn. and the loss on ignition in waste, drinking and technical water. Information is given on the detn. of the total amt. of the insol. material of a water and the estn. of its loss on ignition in order to get an approx. idea of the amt. of the insol. org. constituents. G. Schwoch

The determination of carbon dioxide. Eckerlin. Staatl. Mainwasseruntersuchungsamt, Wiesbaden. *Kl. Mitt. Ver. Wasserversorg. Abwässerbeseitig.* 2, 40–3 (1926); *Chem. Zentr.* 1927, II, 1745.—Ordinary methods used in *water analysis* for the detn. of total CO_2, bicarbonate CO_2, free CO_2 and active CO_2 are described. C. C. Davis

The determination of hardness (of water). Habrich. Landesanst. f. Wasser-, Boden- u. Lufthyg., Berlin-Dahlem. *Kl. Mitt. Ver. Wasserversorg. Abwässerbeseitig.* 2, 39–40(1926); *Chem. Zentr.* 1927, II, 1745.—A description of the Blacher method (cf. *C. A.* 7, 1394). C. C. Davis

Determination of chlorides. Horn. Landesanst. f. Wasser-, Boden- u. Lufthyg., Berlin-Dahlem. *Kl. Mitt. Ver, Wasserversorg. Abwässerbeseitig.* 2, 257–8(1926); *Chem. Zentr.* 1927, II, 1746.—A discussion of the well-known process of Mohr, with the modifications of the process which are necessary with colored waters and waste waters. C. C. Davis

The detection, determination and importance of free chlorine and of hypochlorites

in water. H. KLUT. Landesanst. f. Wasser-, Boden- u. Lufthyg., Berlin-Dahlem. *Kl. Mitt. Ver. Wasserversorg. Abwässerbeseitig.* 3, 184–91; *Chem. Zentr.* 1927, II, 1879.—The detection of Cl and hypochlorites by KI-starch, *o*-tolidine and dimethyl-*p*-phenylenediamine and their detn. with *o*-tolidine and benzidine are described, and the importance of the *Cl treatment of drinking water*, etc., is discussed. C. C. DAVIS

The titration of chlorine in waters with a high salt content. L. W. HAASE. Landesanst. f. Wasser-, Boden- u. Lufthyg., Berlin-Dahlem. *Kl. Mitt. Ver. Wasserversorg. Abwässerbeseitig* 3, 121–6; *Chem. Zentr.* 1927, II, 1879.—A crit. survey of methods ordinarily used in oceanography for detg. the Cl content of strongly salt waters. A very precise detn. of the Cl content is of great importance in oceanography because with the aid of the Cl value, the total salt content and the d. can be calcd. by special formulas. C. C. DAVIS

New indicator for chlorine. KNUT ALFTHAN AND ALEC C. JARVIS. *J. Am. Water Works Assocn.* 20, 407–11(1928).—After considering KI and starch, benzidine and *o*-tolidine, the authors describe dimethyl-*p*-phenylenediamine hydrochloride, which gives with Cl a rich red color and is sensitive to 0.01 mg. in 100 cc. of water. Its disadvantages are: sensitiveness to Fe greater than 0.1 mg. per l. and the necessity of holding the p_H of the sample between 2.6 and 3.4. On the other hand the reaction is rapid and sensitive and but one soln. (methyl red) is required for color comparison. D. K. FRENCH

Preparation of the *o*-tolidine reagent for free chlorine. C. S. BORUFF, S. J. VELLENGA AND R. H. PHELPS. *J. Am. Water Works Assocn.* 20, 404–6(1928).—Theriault's method using HCl is considered most rapid and reliable. The acid concn. should be kept below 178 cc. per l. D. K. FRENCH

The gravimetric and the volumetric determination of lime in water. R. SCHMIDT. Landesanst. f. Wasser-, Boden- u. Lufthyg., Berlin-Dahlem. *Kl. Mitt. Ver. Wasserversorg. Abwässerbeseitig.* 2, 242–7(1926); *Chem. Zentr.* 1927, II, 1745.—Up to the pptn. and filtration of the oxalate ppt. the gravimetric and volumetric methods for the detn. of CaO run parallel, but from this point on the volumetric method has very important advantages. C. C. DAVIS

Determination of plankton (in water). W. F. LANGELIER. *J. Am. Water Works Assocn.* 19, 408–15(1928).—For lab. work the Sedgwick-Rafter method, described in the A. P. H. A. Standard Methods of Water Analysis, has many advantages, but the method of counting is tedious. In routine examn. of water supplies, with the object of controlling the quantity of plankton present, Henson's net method is preferable. The nets used are conical with a Cu or glass container. The vol. of plankton collected is measured after settling or centrifuging and the results are quoted in cc. per cu. m. The main errors of this method depend on the velocity of haul and the ratio of net surface to area of circle. Certain small plankton pass through the net, but these have seldom been shown to have a deleterious effect on taste or odor. Their presence is often indicated by a loss of transparency by the water, and this is used to indicate the need for $CuSO_4$ treatment. B. C. A.

The microscopic life in water. ASA C. CHANDLER. *Proc. 10th Texas Water Works Short School* 1928, 155–9; *U. S. Pub. Health Eng. Abstracts* E-637a, 68(1928).—A discussion of the part played by microscopic organisms in water; factors which influence the development of microscopic organisms with explanations of the influence of sunlight, temp., overturn, food supplies, and aeration; relation between stream pollution and abundance and character of microörganisms; by-products of plant life, such as odor, taste, and color in water; effect of growths on pipes, sand filter beds, and O_2 content of water; and methods for control, such as $CuSO_4$ or Cl_2. J. A. K.

Bacteria growing on leather packing cause errors in sampling. H. H. GERSTEIN. *Eng. News-Record* 101, 407(1928).—The quality of the unchlorinated water in the tunnels between the intake cribs and pumping stations in Chicago is detd. by bacterial analyses of samples of the water collected from hand-operated well pumps. Recent analyses indicated sewage pollution of a degree which could not be accounted for. Check samples taken from the main pumps and with deep water sampling app. showed no such pollution. The leather packing on the plunger and suction valves in the pump cylinders were examd. and found to be contaminated with organisms which conformed to the A. P. H. A. standard test for *B. coli*. Several of these leathers placed in sterile water in Mason jars about 1 year ago have maintained a prolific growth of these organisms, the no. at times reaching as high as several million per cc. The problem has been solved by installation of specially designed pump cylinders which are metallic throughout, the valves being of the ball type. It is pointed out that samples drawn from fire hydrants may be contaminated in the same manner. R. E. THOMPSON

Algae control by creating turbidity at Louisville, Ky. W. H. Lovejoy. *Eng. News-Record* **101,** 505–7(1928).—Filter runs are seriously reduced by algae during certain periods at the Louisville plant. Filter runs have been as short as 30 to 60 min. and wash water as high as 12% of the water filtered. It was observed that this condition obtained when the turbidity of the raw water was low, an increase of as little as 50–75 p. p. m. of turbidity causing disappearance of the algae and lengthening of the filter runs. During two periods in 1927 low runs were successfully combated by artificially increasing the turbidity by pumping sludge from the bottom of the preliminary settling basins to the raw-water inlet of the basins by means of a dredge boat carrying an 8-in. electrically operated dredge pump. Five hrs.' operation of the dredge causes sufficient stirring up to give a turbidity of 500 at the inlet of the basins for 24 hrs. About 80% of this turbidity settles in the 2 preliminary basins, removing a large no. of organisms, and the remaining 100 p. p. m. of turbidity provides a nucleus for an excellent floc in the coagulation basin which carries down an additional no. of organisms. During the treatment the bacterial count and *B. coli* content of the water leaving the basins were lower than in the incoming raw water. Observations have indicated that shortening of the filter runs results from gradual accumulation of algae on the filter sand, which are not removed to any great extent by washing. In future it is intended to create artificial turbidity whenever the river water turbidity drops below 50 p. p. m. and runs show any appreciable decrease. It has been found that a filter with sand of 0.48–0.50 mm. effective size will run on an av. 50–100% longer; during short run periods due to algae, than one having sand of 0.40 mm. effective size, and that the unit with the finer sand will drop off in length of runs more rapidly and regain more slowly than one with the coarser sand. The following treatments were experimented with previously: $CuSO_4$, lime, overdosing with alum, coagulation with Na aluminate and alum, and prechlorination. In addn. the filter sand has been treated with $CuSO_4$, NaOH and hypochlorite. Of these, $CuSO_4$ treatment only, gave temporary relief, and then only when the subsidence period was 4 days or more. The dredge is also used for cleaning the basins without draining, the cost being about 3¢ per cu. yd. R. E. Thompson

Destruction of bacteria by ammonia and chlorine. W. Olszewski. *Chem.-Ztg.* **51,** 269–70(1927); cf. *C. A.* **20,** 2713.—The results are described of the bacteriol. and chem. examn. of water in a swimming pool after treatment with Cl and NH_3. The gases, which are used in the ratio of 2 parts of Cl to 1 part of NH_3 by wt., probably owe their bacteriol. action to the formation of chloramines. This method is superior to treatment with Cl as no odor is perceptible, the water remains clearer and a careful regulation of the amt. of reagents to be added is not required. W. L. D.

Example of the reactivity of siliceous algae to the salt content of water. Konrad Gemeinhardt. Landesanst f. Wasser-, Boden- u. Lufthyg., Berlin-Dahlem. *Kl. Mitt. Ver. Wasserversorg. Abwässerbeseitig.* **1,** 60–1; *Chem. Zentr.* **1927,** II, 1744.—The fresh water diatom *Synedra ulna* is especially sensitive to a high salt content of the water, whereas the development of *Synedra pulchella* is inhibited by lowering the salt concn. C. C. Davis

Dosing apparatus. Wynkoop Kiersted. *Proc. 10th Texas Water Works Short School* **1928,** 54–7; *U. S. Pub. Health Eng. Abstracts* **E-637a,** 68(1928).—K. discusses the 2 basic methods of prepg. and distributing the coagulants by the soln. method. Although soln. feed would probably be more economical in the larger water-works plants, the dry feed method finds greatest favor in the smaller plants. Various methods of mixing the coagulants with the raw water are also discussed. J. A. Kennedy

Present tendencies regarding disinfection. E. C. Farr. *Munic. Eng. Sanit. Record* **81,** 333(1928).—F. advocates "current" disinfection as against present waste of public funds by "terminal" disinfection. C. H. Badger

The water chlorination equipment of the Schau- und Lehrsammlung der Landesanstalt. J. Wilhelmi. *Kl. Mitt. Ver. Wasserversorg. Abwässerbeseitig.* **3,** 198–202; *Chem. Zentr.* **1927,** II, 1878.—A description with drawings of a Cl disinfecting equipment of the Bomag-Meguin-A. G., the chlorination equipment of Dr. Ornstein, and the electrolytic plant of Arthur Stahl, Aue, i. Sa. J. S. Reichert

The halogens and public water supplies. Joseph S. Hepburn. Hahnemann Med. Coll., Philadelphia. *Hahnemannian Monthly* **63,** 641–9(1928); *Catalyst* **13,** No. 7, 21–4; No. 8, 7(1928).—A review devoted to iodization, the use of Cl_2, hypochlorites, chloramines (Cl_2 plus NH_3) and other Cl compds., superchlorination followed by dechlorination, the "chlorine taste" and its prevention and a bibliography. "At the present time, chlorination of municipal water supplies is necessary to prevent epidemics of water-borne diseases. Possibly, in the future, other methods of sterilization may be

devised which will be applicable on a large scale at a low cost and will obviate the addition of bactericides to the water." JOSEPH S. HEPBURN

The oxygen content of water. H. STOOFF. Landesanst. f. Wasser-, Boden- u. Lufthyg., Berlin-Dahlem. *Kl. Mitt. Ver. Wasserversorg. Abwässerbeseitig.* **2,** 13–21 (1926); *Chem. Zentr.* **1927,** II, 1743.—With the aid of 3 tables of the soly. of air in water at 1–30°, of O in distd. water at 0–90° and of O in salt water (0.5–2.0% Cl) at 0–30°, the significance of O in natural waters is discussed. C. C. DAVIS

The function of aeration in water purification. N. T. VEATCH, JR. *Proc. 10th Texas Water Works Short School* **1928,** 172–7; *U. S. Pub. Health Eng. Abstracts* **E-637a,** 67(1928).—Expts. with simple aerators have proved: O_2 may be added to water to the point of satn., CO_2 may be largely, but not completely, removed; *odors and tastes,* due to gases of decompn., may be partially removed but if due to products of org. decompn., the effect is negligible; odors and tastes due to coal tar, phenol and similar wastes are little affected; H_2S and odors due to over-chlorination may be satisfactorily removed; the oxidation of org. matter is negligible but inorg. compds. as Fe and Mn are largely, but not completely, oxidized; bacterial content of the water is often decreased; the economy and effectiveness of treatment with ordinary coagulants are usually increased; corrosiveness of soft or peaty waters is usually increased, whereas surface supplies are not usually affected. Four different types of aerators are discussed: air lift, injection, gravity and fountain aerator. J. A. KENNEDY

Presence and detection of arsenic in water. H. KLUT. Landesanst. f. Wasser-, Boden- u. Lufthyg., Berlin-Dahlem. *Kl. Mitt. Ver. Wasserversorg. Abwässerbeseitig.* **3,** 191–4; *Chem. Zentr.* **1927,** II, 1879.—Following a discussion of the presence and limits of toxicity (0.2 mg. of As_2O_3 per l.), the detection of As by the methods of Gutzeit and of Beck, Merres and Smith are described. C. C. DAVIS

Lead poisoning from lead-piped water supplies. WADE WRIGHT, C. O. SAPPINGTON AND ELEANOR RANTOUL. *J. Ind. Hyg.* **10,** 234–52(1928).—Of ninety sources including city, well and spring waters, all contained lead, and 35 of them caused poisoning as detd. by hemoglobin detns. and the making of blood smears. Of 253 exposed persons, 63 or 24.9% were poisoned. C. M. SALLS

The allowable limit of lead in drinking water and water for other uses. HANS BEGER. Landesanst. f. Wasser-, Boden- u. Lufthyg., Berlin-Dahlem. *Kl. Mitt. Ver. Wasserversorg. Abwasserbeseitig.* **2,** 171–3(1926); *Chem. Zentr.* **1927,** II, 1743.—A study of the literature shows a disagreement over the limiting value above which Pb in water is toxic, the limits varying from 0.025 to 1.0 mg. of Pb per l. C. C. D.

Manganese in Iowa City waters. EDWARD BARTOW AND W. T. BAILEY. *Proc. Iowa Acad. Sci.* **34,** 191–5(1927).—A deposit showing quantities of MnO_2 as indicated by the evolution of Cl from HCl was found in the H_2O pipes from University of Iowa well No. 2 which is located at the laundry. The purpose of the investigation was to det., if possible, whether or not the Mn occurred in any definite strata and whether or not it could be eliminated from wells by casing out Mn-bearing waters. Samples from about 50 wells in Iowa City and the immediate vicinity were analyzed and practically all were found to contain small amts. of Mn. The fact that wells located in the glacial drift contain a fairly large amt. of Mn (0.13 to 0.25 parts per million) together with the extremely large amt. found in the infiltration gallery (1.8 parts per million) would indicate that the Mn occurs largely in glacial and alluvial drifts. The presence of fairly large amts. of Mn in such wells in Iowa City might be explained by the fact that the limestone is not solid, but contains many large crevices through which soil waters may be carried into wells. Results indicate that Mn may be concd. in pockets, as is true of iron, and that it would be impossible to predict where a well might be located to secure a H_2O free from Mn, except perhaps in deep wells in rock. Inasmuch as 5 wells penetrating limestone to depths of from 180 ft. to 400 ft. show less than 0.1 p. p. m. it might be possible to prevent Mn-bearing waters from entering such a well by having a good junction of the casing to shut out the waters from the drift. A short bibliography is appended. W. G. GAESSLER

Iron and manganese removal at Wausau, Wisconsin. EMIL FLATTER. *Am. City* **38,** 125–6; *J. Am. Water Works Assoc.* **20,** 275(1928).—The supply from a well is of poor physical character. After aeration over coke and MnO_2 ore, lime and alum are added, and after coagulation in a Dorr clarifier, the water goes to sedimentation basins and is then filtered. Final chlorination is unnecessary. D. K. FRENCH

English view on rapid sand filtration. S. W. FARRINGTON. *Public Works* **59,** 278–80(1928).—F. comparing American and British water-works practice found that in general American practice is much more standardized than British; but automatic control of chem. dosing for proportioning in accordance with water flow is more common

in England than in America. The use of settling tanks is less common in British practice. On the av. Americans use higher filtration rates. Filter washing with water and air or stirring while not usually used here are considered essential in England.
C. C. RUCHHOFT

What is the best rate of filtration? R. B. SIMMS. *Water Works Eng.* 81, 19; *J. Am. Water Works Assoc.* 20, 278(1928).—The usual rate is 2 gal. per min.; rate of wash water about 15 gal. per min.; length of wash 5 to 6 min. and amount, less than 5% of water filtered.
D. K. FRENCH

Elements of successful coagulation and filtration. HARRY N. JENKS. *Water Works* 67, 203–6(1928); *Can. Eng.* 54, 630(1928).—Adequate pretreatment of the water applied to rapid sand filters is an important factor in maintaining high standard effluents. The proper design of chem. feed app. and of the mixing devices is necessary for insuring accurate measurement of chemicals and proper flocculation. Mech. stirring devices are considered better than gravity mixers. The well-formed floc should not be broken up and the well-clarified water should carry a residual well-formed floc as it reaches the filters. The influences of plant design and operating methods on filtration are discussed.
C. C. RUCHHOFT

Some old and new factors in water softening. DANIEL H. RUPP. *Proc. 10th Texas Water Works Short School* 1928, 115–7; *U. S. Pub. Health Eng. Abstracts* E-607, 60(1928).—Numerous features and methods employed in water softening such as lime and soda ash, split treatment of over-softening the larger portion of flow with subsequent mixing with untreated portion, use of sludge return, and use of the more modern mech. mixing chambers and clarifiers are discussed. Larger alum dosage to obtain reduction of residual hardness below the theoretical quantities which the coagulant should remove and pebble lime as an aid to filtration and softening due to its lower cost per unit of CaO and ease of handling are considered. Reference is made to recarbonization of settled softened water for the purpose of eliminating incrustation of filters and distribution systems and the strides made by the zeolite process in large municipal plants. The treatment known as "the use of CO_2 as a softening reagent together with the excess lime treatment" used at the Piqua, Ohio, softening plant is given in detail. A distinct advantage of the excess lime treatment is the effectual disinfection by the causticity in what is usually the first step of the purification process, the coagulating basins, leaving the filtration and chlorination processes a double factor of safety.
J. A. KENNEDY

Zeolite softening of lime-treated water at Columbus, Ohio, water-softening and purification works. CHARLES P. HOOVER, VIRGIL L. HANSLEY AND CLYDE Q. SHEELY. *Ind. Eng. Chem.* 20, 1102–5(1928).—The purpose of this investigation was to det. whether or not it would be better and more economical for this city to continue to soften its public water supply with lime and soda ash or to use lime treatment in connection with zeolite as a substitute for the soda-ash treatment. The investigation is not as yet complete. Details of operation, data so far accumulated and savings to the city are given.
J. A. KENNEDY

Modern water-softening plant. ANON. *Textile Recorder* 46, No. 542, 45–6(1928).—An illustrated description of the "Osilameter" automatic feed gear for lime and soda ash made by the Paterson Engineering Co., London.
RUBY K. WORNER

Twenty years of experience of sanitary progress in India. F. C. TEMPLE. *J. Roy. Sanit. Inst.* 49, 13–24(1928); *U. S. Pub. Health Eng. Abstracts* E-607c, 17 (1928).—Public water supplies increased from 35 in 1905 to 92 in 1927 in 5 provinces. By judicial use of H_2SO_4 and soda ash, all but one ton of silt p. m. g. is brought down in the settling basins. Drainage progress has been even greater. Expts. have shown that for Indian conditions 2 cu. ft. per user, and 5 and 40 gal. limits of dilns. are approx. the correct septic-tank capacity and sewage dilns.
J. A. KENNEDY

The carbon dioxide tension of the Fraser River and its lower tributaries and of certain tributaries of the Columbia River. EDWIN B. POWERS AND THERSA A. HICKMAN. Univ. of Tennessee. *Pub. Puget Sound Biol. Sta.* 5, 373–80(1928).—Lakes and rivers draining lakes had in general a lower CO_2 tension, av. 0.57, than rivers not fed by lakes, av. 1.05 mm. Hg. Typical mountain streams apparently had a higher CO_2 tension than streams of the lower land. Certain streams, as the Clark Fork of the Columbia River and the Yellowstone River had very low CO_2 tensions, the reasons for which are not well understood. **The carbon dioxide tension, oxygen content, the p_H and the alkali reserve of natural waters mostly of the western portion of the U. S.** EDWIN B. POWERS. *Ibid* 381–91.—The waters of lakes and of rivers draining lakes, other things being equal, had a lower CO_2 tension and a higher O content than

the waters of rivers not fed by lakes. Mountain streams in general had a lower p_H than the streams of the lower lands. L. W. Riggs

Chemical study of the waters of Argyle Lagoon. I. Phoebe Blalock and Thomas G. Thompson. Univ. of Wash. *Pub. Puget Sound Biol. Sta.* 5, 341–53(1928).—The sea water of Argyle Lagoon during the summer months differs from the av. sea water at the Puget Sound Biol. Sta. in its higher temp., greater concn. of dissolved O and a slightly greater p_H. Differences between surface and bottom samples show a definite stratification of the water, even in these comparatively shallow depths. This is especially noticeable at or near the high tides. The condition of the water in the lagoon is affected both by tidal changes and by local meteorological conditions; the influence of the latter predominates except at times of high tide. The org. silt at the bottom of the lagoon contained H_2S. The presence of this gas was not detected in the water. **Chemistry of the waters of Argyle Lagoon. II.** Geo. H. Hitchings, Seldon P. Todd and Thomas G. Thompson. *Ibid* 325–32.—In addn. to the differences noted above, the water of the lagoon has a lower concn. of dissolved and of chem. combined CO_2 than av. sea water. During the summer months, the salinity of the surface waters of the lagoon varies with that of adjacent waters, while the salinity at the bottom remains practically const. With the possible exception of organisms living at the bottom in the deeper portions, the differences in the marine life of the lagoon from that of adjacent waters cannot be attributed to salinity differences. The seasonal variations in the waters of the lagoon are much more marked than those of adjacent waters. L. W. Riggs

Results of a systematic study of water from the Vistula. T. Kirkor. State Hydrological Lab., Warsaw. *Przemysl Chem.* 12, 285–94(1928).—The period covered by this investigation was from March, 1923 to July, 1924. Samples of water were drawn from the Vistula above Warsaw and 42 chem. and 27 bacteriol. analyses were made. The compn. of the water changes over a wide range at different seasons. The averages in mg. per l. were: suspended matter 72.2; residue dried at 110° 214.7; NH_4 0.10; NO_3 trace; NO_3 0.7; SO_4 14.3; Cl 11.2; O_2 (72 hrs. at 20°) 2.2; Fe 0.24; total hardness 14.7 degrees; permanent hardness 0.6; CaO 68.0; MgO 10.0. The bacteriol. analyses gave: bacteria per cm.^{3} 2000; titer for *B. coli comm.* 0.05. Phys. properties: turbid, and of yellow color; the suspension is largely sand and clay. Analyses of waters from Oder, Laba, Danube, Neva, Dnieper and Vistula 50 yrs. ago are given for comparison. A. C. Zachlin

Clarification of the Catskill water supply of New York City. Wm. W. Bush. *Water Works* 67, 141–4(1928).—During November 1926 very heavy rains resulted in turbidities around 100 in the Schoharie and Ashokan reservoirs of the Catskill system. Examn. showed that prolonged standing would not satisfactorily remove this turbidity and therefore clarification with soda ash and alum was necessary. The soda ash was introduced into the aqueduct at the Ashokan reservoir 75 miles above the Kensico reservoir and the alum was added to the aqueduct at Pleasantville 3 miles upstream from the Kensico reservoir. The floc settled in the Kensico reservoir and a satisfactory water was produced. The treatment was continued from December 1926 until May 1927. C. C. Ruchhoft

Factors considered in the design of the Abilene, Texas, water-purification plant. O. K. Hobbs. *Proc. 10th Texas Water Works Short School* 1928, 57–61; *U. S. Pub. Health Eng. Abstracts* E-576b, 56(1928).—Lake Abilene, located 19 mi. S. W. of the city of Abilene, furnished that town with a water supply by gravity through 18 in. cast iron pipe to two 20-million-gal. storage basins. A 4 m. g. d. treatment plant has been designed to include special methods of proportioning the chem. dosage. Specially designed chem. control machines have been installed, operating under the principle of the under-shot water wheel placed in a channel carrying water to the treatment plant, the wheel acting as a positive displacement meter and furnishing power to drive the machines which mechanically measure out the lime slurry and the iron soln. used in the softening and coagulation of the raw water. Special types of mixers and weirs have been included in the design and are discussed. The sedimentation basins are sepd. into 2 compartments, the first giving a detention period of 45 mins. and taking 95% of the deposit. The settled coagulant can be withdrawn from the basin daily by the hopper bottom flushing arrangement. The basin is baffled on the over and under system and all units are arranged so that the plant can be operated by one attendant. The cost of treating this water, including labor, power, chemicals and interest and depreciation on the plant, amounts to $26 at a 2 m. g. d. rate. Expectations are that this cost will be reduced to $5.94 when the designed capacity of the plant is reached. J. A. Kennedy

The new Bloomington, Indiana, water works. PAUL HANSEN. *Water Works*, **67**, 219–21(1928); *U. S. Pub. Health Eng. Abstracts* **E-576b**, 56(1928).—Historical development of this city's water works is given. In 1927, pumping and filtration works of 2 m. g. d., which may be extended to 8 m. g. d., were authorized. J. A. KENNEDY

Municipal undertakings at Exmouth (England). SAMUEL HUTTON. *Munic. Eng. Sanit. Record* **81**, 332–3(1928).—The consumption of water varies from 410,000 gals. (Jan., 1928) to 600,000 gals. (summer) per 24 hrs. The trunk-main capacity is 760,000 gals. The available supply is over 1 million gals. New mains are being built as required. All the sewage discharges into the channel at all tides; that from about $^2/_3$ of the population is by gravity and the rest by pumping. The system is 28 yrs. old; it will be improved at the expiration of certain loans in 1930. C. H. BADGER

Scarborough (England) water works. HERBERT LAPWORTH. *Munic. Eng. Sanit. Record* **81**, 320(1928).—The water supply is obtained from a deep well and bore hole 428 ft. deep. Two low lift and 2 high lift pumps operated by 2 steam engines pump 1,300,000 gals. per day. The low lift pumps raise the water from the wells to the sand filters and the high lift pumps force the filtered water through $3^1/_2$ miles of main to service reservoirs. The present pumping plant is over 40 yrs. old. The new scheme provides for a water supply of 2,640,000 gals. per day (an addnl. well and bore hole 430 ft. deep having been completed) pumped by 2 low lift and 4 high lift pumps, electrically driven, into 2 mains. The estd. cost is £ 102,150. C. H. BADGER

New water works and filtration plant at Laredo, Texas. R. T. REILLY. *Water Works* **67**, 247–8(1928).—The new filter plant located on high ground upstream from the source of pollution has its intake in the Rio Grande River and includes low lift pumps, aerators, mixing and coagulation basins, filters, clear well and high lift pumping station. The mixing will be accomplished in circular tanks by peripheral velocity without mech. agitation. The settling basins are circular with a total detention period of 6 hrs. There are 4 filters with a total capacity of 6 m. g. d. C. C. RUCHHOFT

The newly completed water works of the city of Oneida, New York. NICHOLAS KNIGHT. Cornell Coll., Mt. Vernon, Ia. *Proc. Iowa Acad. Sci.* **34**, 219(1927).—The supply comes from Florence Creek, 22 miles north of the city. A 20-in. main conveys the H_2O. The watershed contains 17 sq. miles, very sparsely settled and the danger from contamination is slight. There is an unusual amt. of pptn in that section of New York State; in the dryest year of recent times, the rainfall was 41.28 in. A dam 400 ft. long and 50 ft. high, near the village of Taberg will impound the H_2O, 200,000,000 gals. It is estd. that this would furnish the city a 3 months' supply, should no rain fall during the period. The former supply was found unusually hard in $CaSO_4$; an analysis of the new supply showed it to be unusually soft and pure. W. G. G.

San Francisco water supply. G. A. ELLIOTT. *J. Am. Water Works Assoc.* **20**, 294–307(1928).—The nature and extent of the Hetch Hetchy development are described While the water is of excellent quality, as a precaution, chlorination plants are located at the outlets of all sources of supply. D. K. FRENCH

The St. Louis water problem. L. A. DAY. *Proc. 10th Texas Water Works Short School* **1928**, 105–11; *U. S. Pub. Health Eng. Abstracts* **E-607b**, 62 3(1928).—D. describes the source of supply of the water, its delivery from the Mississippi River at the Chain of Rocks Plant to the grit chamber and mixing conduit where milk of lime and a soln. of sulfate of Fe are added. There are 6 coagulation basins, each of 30 m. g capacity. Secondary coagulation with Al sulfate is provided. There is included a description of the Howard Bend Plant on the Missouri River. Advantages expected from the new plant are discussed. J. A. KENNEDY

Boiler-feed water W. R. MCALLEP. *Facts About Sugar* **23**, 950 1(1928). —To replace steam losses under the conditions obtaining in Hawaiian sugar mills some 130 to 260 lb. of make-up water is required per ton of cane. Fresh water is generally used for this purpose. M. recommends the use of condensed vapors (as in beet sugar plants), of which there is an excess of about 400 lb. per ton of cane after the requirements of the maceration and filters are satisfied For maintaining the required p_H in the boiler water he suggests the use of lime water in preference to Na_2CO_3. NaOH, derived from the latter by hydrolysis under modern boiler pressures, may accumulate to such a concn. around rivets and in other capillary spaces as to involve embrittlement hazards. M. J. PROFFITT

Treatment of boiler feed waters of low incrustant content. S. C. JOHNSON. Water Supply Dept. Chesapeake and Ohio R. R., Huntington, W. Va. *Ind. Eng. Chem.* **20**, 1071–2(1928).—Few water supplies are so good that some form of treatment does not improve them. The controlled addn. of predetd. amts. of suitable softening agents and

a satisfactory blowoff schedule amply reward the efforts and expenditures involved in the treatment of waters of even low incrusting solid content. J. A. Kennedy

Minerals affect feed water. J. B. Romer. *Power Plant Engineering* **32**, 923 (1928).—Impurities in boiler feed water result in scale, corrosion, embrittlement, priming and foaming with consequent weakening, early failure and wet steam. Boiling water at atm. pressure removes Ca, Mg and carbonate. These, in pptd. form, should be allowed to settle out before the water enters the boiler. The decreasing soly. of $CaSO_4$ with rise in temp. causes it to ppt. on the hottest parts, making an insulator and causing blister, and eventually ruptures in boiler tubes. Non-scale-forming salts, such as $MgSO_4$, $CaCl_2$, $MgCl_2$ and $NaHCO_3$ after they have been hydrolyzed may cause corrosion. Ideal feed water is hard to obtain and treatment inside the boiler is never as good as outside treatment. S. D. Poarch

Corrosion of iron water pipes and methods of treating water to reduce corrosion. J. R. Baylis. *Baltimore Eng.* **2**, 6–10; *J. Am. Water Works Assocn.* **20**, 285.—Much theoretical discussion is added to the material of a previous paper (*C. A.* **21**, 2751). D. K. French

Prevention of corrosion in the chemical cleaning of condensers and boilers. Fr. Lieneweg. *Wärme* **50**, 507–11; *Chem. Zentr.* **1927**, II, 1301.—The influence of boiler scale on the economy of condensers and boilers is discussed. and the necessity of a thorough and frequent removal of the scale emphasized. The corrosion sometimes occurring in the cleaning (with HCl, etc.) is limited by adding preservatives. The various kinds of corrosions are described and advice is given for their prevention. G. Schwoch

Experience with a boiler-scale preventive. N. Broglio. *Arch. Wärmewirt.* **9**, 111–5(1928).—B. describes the good results obtained with a proprietary product, "Tartricid," stated to consist mainly of substances similar to *tannic acid.* E. W. T

The countercurrent electro process. E. Schulz. *Arch. Wärmewirt.* **6**, 247–8 (1925).—The front and back of the boiler are connected to the 2 sides of a d. c. line through 2 C-filament lamps. This prevents the formation of boiler scale, and loosens old scale. The mechanism is doubtful; presumably it is an electrolytic effect. Ernest W. Thiele

What effect has the introduction of sulfite waste liquor upon the acidity of river water? Erik Öman. Techn. Hochschule, Stockholm. *Papier-Fabr.* **26**, 529–32 (1928).—The titratable acidity is of less importance than the actual acidity, which was detd by colorimetric p_H measurements on samples removed periodically from various points in the stream. The values found were: river water above mill, 6.6; with waste liquor in 1:350 diln., 4.8; with waste liquor in 1:3000 diln., 6.4. The buffer capacity of the water may have a considerable effect. Atm. oxidation of SO_2 to SO_3 may further decrease the p_H by about 0.2 units. The highest acidity found is probably without harmful effect upon aquatic life; this does not preclude such an effect from other components of the liquor. R. H. Doughty

Stream pollution—self purification of streams. H. W. Streeter. *Proc. 10th Texas Water Works Short School* **1928**, 240–7; *U. S. Pub. Health Eng. Abstracts* **E-637**, 50(1928).—A résumé of the increasing importance of the stream pollution problem, and of the work which is being carried on in order to measure quantitatively the effects of stream self purification and to det. the main factors responsible for it. J. A. K.

Phenol pollution of public water supplies in the Middle West. Herman N. Bundesen. *Water Works* **67**, 240–6(1928).—The work that has been done on the elimination of coke-plant phenol-carrying wastes from public water supplies is reviewed. The 3 methods used for disposing of these wastes are: evapn. by coke quenching, extn. by light oils or benzene and biological absorption in sewage. The phenol wastes produced by the 3 large coke plants in the Calumet Harbor region at the south end of Lake Michigan could be disposed of by either one of the first 2 methods discussed. C. C. Ruchhoff

The double fermentation process with intermediate liming (Hildesheimer process). A contribution to the question of the purification of waste liquors from the sugar factory. E. Nolte. *Kl. Mitt. Ver. Wasserversorg. Abwässerbeseitig.* **3**, 121–33; *Chem. Zentr.* **1927**, II, 1878.—The double fermentation process is suitable when with the existing water supply the water purification is to be increased at a low cost. With a low water flow the putrefactive fermentation process is preferred. Both processes can, however, be recommended under proper surroundings only for the purification of press and diffusion liquors, and not for other waste liquors from the sugar plant. J. S. R.

The biology of activated sludge. R. Kolkwitz. Landesanst. f. Wasser-, Boden- u. Lufthyg., Berlin-Dahlem. *Kl. Mitt. Ver. Wasserversorg. Abwässerbeseitig.* 1926, 3,

Beiheft. 70–4; *Chem. Zentr.* 1927, II, 1744.—Biological studies carried out at the exptl. plant at Essen with activated sludge suggest a microscopical biological method of control. C. C. Davis

The present status of new biological processes for the purification of waste water with activated sludge. C. Reichle and R. Weldert. Landesanst. f. Wasser-, Boden- u. Lufthyg., Berlin-Dahlem. *Kl. Mitt. Ver. Wasserversorg. Abwässerbeseitig.* 1926, 3 Beiheft 3–69; *Chem. Zentr.* 1927, II, 1774.—A description of processes in America, England and Germany. C. C. Davis

The occurrence of arsenic fungi on sludge. Else Huth. Landesanst. f. Wasser-, Boden- u. Lufthyg., Berlin-Dahlem. *Kl. Mitt. Ver. Wasserversorg. Abwässerbeseitig.* 2, 152–4(1926); *Chem. Zentr.* 1927, II, 1744; cf. Tiegs, *C. A.* 22, 4561.—Arsenic fungi are found in the sludge of settling basins of Königsberg and at the surface of the silt of the Frische Haff. C. C. Davis

The transformation of organic and of inorganic substances in general. I. K. Thumm. Landesanst. f. Wasser-, Boden- u. Lufthyg., Berlin-Dahlem. *Kl. Mitt. Ver. Wasserversorg. Abwässerbeseitig.* 2, 30–2(1926); *Chem. Zentr.* 1927, II, 1744.—As an introduction to a detailed descriptive account of the transformation of the components of waste water by biological processes, the underlying principles are explained. C. C. Davis

Sewage works analyses. F. W. Mohlman. *Proc. 10th Texas Water Works Short School* 1928, 221–32; *U. S. Pub. Health Eng. Abstracts* E-637, 50(1928).—M. points out the necessity of intelligent interpretation of sewage and effluent analyses and suggests that the less informative methods of past years be discarded in favor of more valuable methods now being improved and standardized. The technic of the *biological oxygen demand detn.* and its significance in sewage treatment and stream pollution are discussed. J. A. Kennedy

Calculating the capacity of sludge-digestion tanks. Karl Imhoff. *Am. City* 38, 124–5(1928); *U. S. Pub. Health Eng. Abstracts* E-637a, 52.—Ordinarily with a mean temp. of 59° F., 1 cu. ft. per capita sludge vol. is required. At 50° F., the vol. must be doubled. In the northern part of the U. S. where the winters are more severe, and in towns of less than 5000, the capacity of the sludge tank should be increased. The size depends upon the time interval between draining sludge in the fall and spring. At 59° F., 2 months time is necessary for complete digestion. Addnl. allowance must also be made for wastes likely to retard digestion. J. A. Kennedy

Preliminary results on relation between total acidity, carbon dioxide in solution, organic acids and colloidal material in the course of fresh solids digestion. Willem Rudolfs. *Rept. of the Dept. of Sewage Disposal of the N. J. Agr. Expt. Sta. for the year ending June 30,* 1927, 295–9; *U. S. Pub. Health Eng. Abstracts* E-607b, 46(1928).—For the first 3 days the increase in total acidity was practically all accounted for by the CO_2 in soln. but after 3 days the org. acids began to accumulate rapidly and during the next 10–20 days constituted approx. $^1/_2$ of the total acidity. This would indicate that the decompn. of the carbonaceous substances producing the acids is faster than the decompn. of the acids themselves with the consequent accumulation of the acid material. After 20 days the org. acids decreased rapidly and after 30 days only traces were left. Accumulation of org. acids increased the duration of digestion. Decompn. of nitrogenous substances seemed fastest after the org. acid disappeared. J. A. K.

Filtering materials for sewage work—kind, size and depth. N. T. Veatch, Jr. *Proc. 10th Texas Water Works Short School* 1928, 183–6; *U. S. Pub. Health Eng. Abstracts* E-607d, 49(1928).—Granite, trap rock, quartzite and gravel have proved almost uniformly satisfactory. The size of material used ranges from a grading of $^1/_4$–$2^1/_2$ in. to 2–3 in. With ample head the depth ranges from 6 to 9 ft. for trickling filters, whereas contact beds are usually from 4 to 6 ft. Fine-grained filtering materials usually consist of sand and appear to give the results best of all types of plants. A majority of the beds range from 3 to 4 ft. in depth above the drains. Uniformity of coeff. ranges from 2.5 to 3.5 and effective size from 0.25 to 0.50 mm. in the majority of the plants. J. A. Kennedy

Power gas from sludge. F. C. Vokes and C. B. Townsend. *Water Works* 67, 222(1928).—See *C. A.* 22, 655. C. C. Ruchhoft

Plants for clarifying and purifying sewage. A. Battige. *Apparatebau* 40, 206–9 (1928).—Directions for constructing septic tanks for single dwellings. J. H. M.

Precast concrete simplifies Imhoff tank work. Walter L. Couse. *Eng. News-Record* 101, 430–3(1928).—An illustrated description of the construction of the Imhoff tanks of the new Flint, Mich., sewage works. R. E. Thompson

Seeding new tanks. William Rudolfs. N. J. Agr. Expt. Sta. *Rept. Dept.*

Sewage Disposal 1927, 284–92; *Pub. Health Eng. Abstracts* E-545, 30(1928).—The difficulty sometimes experienced in starting the operation of a new tank was deemed of sufficient importance to warrant lab. expts. to det. a substitute for ripe sludge when the latter was not available. Definite quantities of fresh solids were mixed with ripe sludge, horse manure, cow manure and muck from a creek and results compared with fresh solids seeded with ripe Imhoff sludge. It was found that neither manure nor muck is as effective for seeding as ripe sludge. Muck was about half as good as ripe sludge and cow or horse manure still poorer. If sludge from a pollution stream is available for seeding it should be used. Seeding with lime and horse manure is beneficial but is still inferior to ripe sludge. Addns. of lime to fresh solids when ripe sludge is present for seeding, aids materially in keeping down the floating solids.
C. R. Fellers

Studies on controlling Psychoda alternata Say in sprinkling filters. Daggmar H. Peterson. N. J. Agr. Expt. Sta. *Rept. Dept. Sewage Disposal* 1928, 300–10.—The life cycle of *Psychoda* requiring about 12 days is given. Expts. were made to det. the effectiveness of 50 com. and lab. insecticidal prepns. Aside from flooding the filter bed, no economical method of control for *Psychoda* was found. Oils were more effective than emulsions. *o*-Dichlorobenzene mixed with an equal part of kerosene killed over 90% of the larvae when a l. per sq. ft. was applied. "Flit" at 75 cc. per sq. ft. was equally satisfactory. *p*-Dichlorobenzene in cryst. form caused a high % of deaths when 50 g. per sq. ft. was applied. CS_2 was lethal in an emulsion of 1:100. Continuous application of Cl reduced the no. of larvae but not sufficiently to warrant the expense. Flooding the filter beds greatly decreased the nos. but the larvae were not destroyed.
C. R. Fellers

Emscher basins and separate sludge digestion in the last 22 years. F. Fries. *Gesundh.-Ing.* 51, 577–83, 601–5(1928).—Much improvement has been effected in mech. treatment of city sewage during the last 22 years. All successful installations consist of sep. sedimentation and digestion chambers. With the exception of plants designed to dispose of sewage from individual dwellings, the one-chamber processes have been replaced by sep. sedimentation and digestion. Of the various systems now in use, the Emscher basin is among the best. One of the improvements possible is the simplification of the size and shape of the app. used in gathering the gas produced during the digestion of the sludge. Agitation or mixing of the sludge has been used for some time. In regard to decompn. of the sludge, the temp., the p_H value and the ratio of fresh sludge to digested sludge in the digestion chamber are important. When large digestion chambers with flat bottoms are employed, rakes may be used for the economic removal of the digested sludge from the digestion chambers. In sep. sludge digestion, the best results are obtained when the fresh sludge is admitted at a const. rate. The efficiency is increased by raising the temp. of the digesting sludge. The proportion of the gas obtained to that employed for heating depends upon the size and characteristics of the digestion chamber as well as upon the time of digestion. Economy of operation, when the digesting sludge is warmed, is possible only when the water content is low. Emscher basins, using prewarming of the sludge, have proved very efficient at Essen-Rollenhausen. From this it is concluded that pre-warming of the sludge more than any other factor causes increased efficiency without noteworthy rise in operating costs. The question as to whether the 2 chambers should be built alongside of each other or one on top of the other depends upon local conditions. Views are given which illustrate principal methods of sewage treatment. W. L. D.

Criticism of domestic sewage-treatment plants. Leiner. *Gesundh.-Ing.* 51, 552–5(1928).—Centralized treatment of sewage is much better than treatment in small plants. However, in many instances this method is not available and in such cases, it is better to install small treatment works. Criticism as to the size of decompn. chambers, sepn. of the sludge, velocity of inflowing sewage and construction of small installations is given.
Wayne L. Denman

The design of settling basins for sewage-treatment plants. Karl Imhoff. *Water Works* 67, 229–30(1928).—Settling basins for sewage having a flocculent sludge should be designed according to time and for sewage with a granular sludge according to surface area. Design on the basis of velocity is important in grit chambers.
C. C. Ruchhoft

Novel sewage-treatment methods in small plant. Harry R. Hall. *Public Works* 59, 246–8; *Water Works* 67, 235–9(1928).—The plant described has a capacity of 250,000 gallons per day for a population of 2500 people. A primary settling Imhoff tank and a circular sep. sludge digestion tank are provided. This is unusual for this size of plant, but they were built on account of the saving in construction which was

effected. The plant also includes a secondary settling tank and a sprinkling filter, the stone of which is sloped at a 45° angle on 3 sides instead of being confined by a wall. C. C. RUCHHOFT

Sewage treatment abroad. WILLEM RUDOLFS. *Public Works* **59**, 265–8, 310–12 (1928).—This paper describes briefly new grease removers, submerged contact aerators, several new types of aeration tanks, new Imhoff tanks and gas collectors which have been developed in Holland and Germany. C. C. RUCHHOFT

Sewage works designed to meet needs of automobile town. WALTER R. DRURY. *Eng. News-Record* **101**, 357–8(1928).—A description of the recently completed sewage works of Flint, Mich., consisting of radial-flow Imhoff tanks and sludge-drying beds. Trickling filters, secondary sedimentation tanks and chlorinating equipment will be added in the near future. The city is sewered on the separate plan and the sewage is very strong, contg. oil and grease and other trade wastes. The sewage flow is 10$^1/_2$ million gallons per day from a connected population of 120,000. There are 4 Imhoff tanks designed for a capacity of 4 million gallons per day each, the sludge capacity being equiv. to 2.75 cu ft. per capita. The sludge-drying area provided is equiv. to 0.75 sq. ft. per capita for a population of 160,000. R. E. THOMPSON

Activated-sludge disposal plants at Charlotte, N. C. E. G. MCCONNELL. *Public Works* **59**, 268–74(1928).—The Irwin Creek plant, which is described, includes coarse bar screens, 6 aerating and settling tanks with a rated capacity of one million gallons each, 2 conditioning tanks and 2 Oliver filters. Each coupled aerating and settling tank is a complete unit. The settling tanks are equipped with Link Belt type sludge collectors. $FeCl_3$ and alum are used as conditioning chemicals, about 8 lb. of the former being used per 1000 gallons under av. conditions. About 7 tons of 80% moisture filter cake are produced daily and have been spread upon the grounds adjoining the plant, plowed under and planted without appreciable odors. C. C. RUCHHOFT

Sewage treatment in the region of Chicago. PAUL HANSEN. *Proc. 10th Texas Water Works School* **1928**, 210–21; *U. S. Pub. Health Eng. Abstracts* **E-637**, 50(1928).—The work being done in sewage treatment, both by the city of Chicago and in its various Sanitary Districts is summarized. General design data are given for the North Side, Des Plaines, West Side and Calumet plants in Chicago, as well as those for *Indianapolis, Milwaukee, Elgin, Springfield, Decatur, Urbana-Champaign, Hinsdale* and *Wheaton* Sanitary Districts. J. A. KENNEDY

Industrial waste work of the sanitary district of Chicago. F. W. MOHLMAN. *Water Works* **67**, 163–6(1928).—The biological O demand of domestic sewage per capita per 24 hrs. at 20° has been detd. as 0.167 lb., 0.220 lb. and 0.244 lb. for 5, 10 and 20 days, resp. These factors are used to convert industrial wastes of an org. nature into terms of equiv. population. Treatment of the 3 principal wastes including *packinghouse, tannery* and *corn products*, which were equiv. to a population of 1,537,000 in 1922, have been studied extensively in exptl. treatment plants (testing stations). The activated-sludge method was found satisfactory for packinghouse wastes. Biological treatment proved uneconomical for tannery wastes and screening and sedimentation proved most successful. Neither settling nor the activated-sludge method proved satisfactory for corn products wastes while a 7.5-ft. deep trickling filter gave satisfactory effluents at a rate of 700,000 gallons per acre per day. By a recirculation of the waste waters from the starch and gluten settlers and a removal by concn. of feed material, the population equiv. of the corn products wastes was reduced from 380,000 in 1922 to 75,000 at present. About 8 to 10 tons of H_2SO_4 from the Sherwin Williams Paint Co. is being discharged daily in the sewers entering the Calumet Treatment Works which was receiving about 41 million gallons of sewage per day. This waste reduced the p_H and the bacterial content of the raw sewage and produced a harmful effect in the plant, especially the activated-sludge tanks. Storage tanks for equalizing the flow of acid are being installed. C. C. RUCHHOFT

Sewage-disposal plant construction at Fond du Lac, Wisconsin. L. R. HOWSON. *Water Works* **67**, 232–3(1928).—The new plant with a capacity of 4 m. g. d. includes coarse screens and pumping station, settling tanks with Dorr clarifier equipment, sludge-digestion tanks with Dorr digestor equipment, sludge-drying beds, sprinkling filters and an outfall into Lake Winnebago. C. C. RUCHHOFT

The design of small sewage-treatment works at Gaithersburg, Md. HARRY R. HALL. *Water Works* **67**, 235–9(1928); *U. S. Pub. Health Eng. Abstracts* **E-637**, 51 (1928).—This is an account of a painstaking study to fit a high grade of treatment (sprinkling filter) to a town of 2000 people by designing economically with easiest extension of the plant. A full description is given. J. A. KENNEDY

Recent sewage studies at Houston, Texas. G. L. FUGATE AND W. S. STANLEY.

Proc. 10th. Texas Water Works Short School **1928,** 199–201; *U. S. Pub. Health Eng. Abstracts* **E-607d,** 47–8(1928).—When the activated sludge in the lagoons falls below p_H 7.0, crusting of the surface and highly offensive odors result. Persistent stirring and hosing alleviate the condition somewhat. Expts. on dewatering and drying the sludge, instead of lagooning, finally indicated that a vacuum disk filter would be the most economically efficient method of handling the sludge. Activated sludge should be conditioned to a p_H of 5.4, well aerated, and with as little agitation as possible after the addn. of the conditioner, for successful filtration. If the moisture content was kept below 85%, no difficulty was presented in drying the cake obtained after filtration.
J. A. KENNEDY

The Jacksonville, Texas, sewage-disposal plant. H. L. THACKWELL. *Proc. 10th Texas Water Works Short School* **1928,** 204–7; *U. S. Pub. Health Eng. Abstracts* **E-607d,** 48(1928).—This plant treats 400,000 gals. of domestic sewage per 24 hrs. The units comprise a combined grit and screen chamber above ground; primary settling tanks with 1-hr. retention; and a contact aerator with 1-hr. retention, employing brush-wood media on a Monel metal hammock over filtros plates in precast concrete containers. Air is applied in this last unit at the rate of 0.25 cu. ft. per gal. of sewage. The coagulated sewage from this activation plant is then passed into a secondary settling tank for a 15-min. detention period and after rising through a gravel filter supported on a Monel metal screen, the effluent falls over a step aerator into a dosing tank. The dosing chamber sprays the sewage under a $9^1/_2$-ft. head to a trickling filter bed rated at 500,000 gals. per acre ft. The bed is 6 in. deep with perforated tile under-drains. The effluent is chlorinated and then run through a humus tank of the Imhoff type with a 20-min. retention period. Sludge is cared for in a covered concrete sludge tank arranged for digestion. The glassed-over sludge-drying bed is provided for drying and removal of digested sludges. The total cost was $35,000. The cost of operation is about $22 p. m. g. which includes pumping costs of 2 lift stations.
J. A. KENNEDY

Experience with the construction and operation of the purification plant at Kettwig. MAHR. *Technischen Gemeindeblatt* **31,** 15 pp.(1928); *U. S. Pub. Health Eng. Abstracts* **E-637a,** 52(1928).—Kettwig is a small town of about 7000 on the lower Ruhr. The sewage treated contains in addn. to normal constituents, large amts. of wastes from spinning mills, cloth factories (heavily polluted with dyes), and wool-washing plants. The process includes circulation of sewage on long, shallow sand beds, Imhoff-tank treatment and sludge-drying beds. A complete description of the plant construction and methods employed is given. J. A. KENNEDY

Luton (England) new sewage pumping station. J. W. TOMLINSON. *Munic. Eng. Sanit. Record* **81,** 338(1928).—A brief description of the equipment of the plant such as the kinds of engines, pumps, boilers, etc., is given. C. H. BADGER

Schenectady sewage-plant operation. MORRIS M. COHEN. *Public Works* **59,** 223–5(1928).—During 1927 a reduction in the amt. of hosing to the gas vent scum was accompanied by a reduction in the foaming, a better texture of the sludge withdrawn and a reduction in the cost of labor at the plant. In the spring as the level of the scum built down to the level of the slots and solids belched through the slots the tanks were rested until the slots became clear. Units were rotated in non-operation until May. Parallel operation of tanks with and without chlorination (4 p. p. m.) of the raw sewage showed no deleterious effect. The trickling filters operated well. They were flooded 8 times for *Psychoda* control. An interesting attempt was made to distribute *Archorutus viatrius* after flooding. These insects were floated to the surface during flooding, skimmed off and stored in metal baskets during the period of flooding and then put into the siphon chambers for distribution over the bed area.
C. C. RUCHHOFT

Waco's new activated-sludge disposal plant. C. C. HAYS. *Proc. 10th Texas Water Works Short School* **1928,** 207–9; *U. S. Pub. Health Eng. Abstracts* **E-637,** 50 (1928).—This plant of 4 m. g. d. capacity comprises bar screens, grit chambers, presedimentation tanks with mech. sludge-removal equipment, aeration tanks of the Manchester design, and settling tanks with the mech. sludge-removal equipment. Sludge is disposed of in adjoining lagoons. Operation costs are $11.90 p. m. g.
J. A. KENNEDY

The treatment and utilization of vegetable refuse. P. S. WOOLEY. *Munic. Eng. Sanit. Record* **81,** 264–5(1928).—The incoming vegetable refuse is mechanically pulverized. The pulped mass is agitated in a sepg. device where stones, crockery, iron, etc., are removed by gravity. The surplus water is screened through fine copper gauze on a slowly revolving drum. Heavy rolls next break down the cell matter and

free the contained water. It passes on to a traveling felt where the water is squeezed out between other heavy rolls. The residue is dried; a salable and hygienic product is thus produced. C. H. BADGER

Sewerage and sewage disposal as affecting public health. ERIC RIDEAL AND H. C. H. SHENTON. *Munic. Eng. Sanit. Record* **81**, 368–9(1928).—Sewage works should deliver 0.18 to 0.27 lb. of easily assimilable O per capita per diem at min. expense. Since all sewage undoubtedly contains pathogenic bacteria, *e. g.*, *B. tuberculosis* the air near sewer overflows and lagoons of septic sewage is potentially dangerous. Bacteria are set free by evapn. of droplets and through splashing or bursting of gas bubbles from septic sewage. These may be kept afloat for days by air currents because of their lightness and large surface area. Sewage also contains an enormous no. of organisms likely to cause food spoilage. The oscillation of a water piston up and down tidal rivers or the rate of displacement of sewage effluent by fresh and sea water dets. whether a menace will be caused or not. Spores of fungi and molds develop into mature organisms on food material available for them in many discharges and make the lower regions of rivers unsightly for miles and possibly affect fish life. C. H. BADGER

Chemical determinations in the field of air hygiene. I. W. LIESEGANG. *Kl. Mitt. Ver. Wasserversorg. Abwässerbeseitig.* **3**, 4–10; *Chem. Zentr.* **1927**, II, 1990.—Detns. of the sulfate in pine needles and in snow furnishes a starting point towards estg. the extent of contamination of air by flue gas. C. C. DAVIS

Effect of antiseptic sprays on the bacterial content of air. S. R. DOUGLAS, LEONARD HILL AND WILSON SMITH. *J. Ind. Hyg.* **10**, 219–26(1928).—Expts. on two antiseptic sprays suitable for use in places of public assembly or in crowded workrooms show a distinct bactericidal effect on *Bacillus coli communis* suspended in the atmosphere. C. M. SALLS

Carbon monoxide. D. STAVORINUS. Westergasfabriek, Amsterdam. *Het Gas* **48**, 338–41(1928).—From literature data it is shown that CO liberation by escaping illuminating gas is very insignificant as compared with the pollution of the atm. by CO from internal-combustion engines. B. J. C. VAN DER HOEVEN

Investigation of atmospheric pollution. ANON. *Dept. Sci. Ind. Research (Brit).* **1927**, 13th Rept., 54 pp.—Observations in the year ending March 31, 1927, on 79 deposit gages and 11 automatic filters maintained at 34 stations in England are reported, and the deposit of impurity at 80 different stations is considered. A classification is made according to standards of increasing quantity of deposit. During the 13-year period an improvement was noted at stations where there was only moderate pollution; but at stations where the pollution was greatest, little improvement was noted. Carbonaceous or sooty matter made its highest deposit at Newcastle-on-Tyne, the lowest being at Rothamsted. The highest deposit of sulfates was at Burnley, the lowest at Southport (Hesketh Park). There is a wide variation in the compn. of deposits, depending upon both season and location. The increasing use of gas partly accounts for the reduction of sulfates noted during recent years. The hourly variation in suspended smoky matter in the air and the effects of the coal stoppage of 1926, are demonstrated graphically. An account of the salt haze at Norfolk is given and a method of trapping it for examn. is described. A curve demonstrates the fact that nearly the whole of the ultra-violet radiation of the sun is cut off by a comparatively small amt. of smoke in the air. C. M. SALLS

Air investigations to determine smoke damage. M. BAMBERGER AND J. NUSSBAUM. Technische Hochschule, Vienna. *Z. angew. Chem.* **41**, 22–6(1928).—To det. the av. SO_2 content of air over a long period of time a 1.5-l. wide-mouth bottle was wrapped in absorbent cotton wet with a soln. contg. 1 part K_2CO_3, 1 part H_2O and 2 parts (all by wt.) of glycerol (sp. gr. 1.26), and then placed in a glass dish to catch the excess of soln. A wooden stopper in the bottle supported a protective shade for the app., and through the stopper a funnel passed into the bottle (which contained some K_2CO_3), thus converting it into a rain-gage. The whole app. was fastened securely to a support, say on a roof. After an exposure of some months the cotton was washed off thoroughly with H_2O, the soln. oxidized with Br-water, concd. by evapn., acidulated with HCl, and then pptd. with $BaCl_2$. Results obtained with a number of these pieces of app. distributed over a region under investigation for smoke damage gave surprizingly clear indications as to the probable distribution of the SO_2, *i. e.*, of the smoke. By observing the form and extent of the smoke cloud it was concluded that its height above the ground remained fairly uniform for a given state of the weather, but rose or fell greatly with changes in the weather. The av. values of the SO_2 content of air at a given place depends upon the length of time the smoke is present. A formula

$S = a.\dfrac{b - H}{D}$, is proposed for connecting the SO_2 content of the air (S) with the altitude above sea-level (H) and distance from the source (D) of smoke; a represents a const. depending upon the duration of the investigation, frequency and strength of the smoke, size of the impregnated fabric, quantity of smoke emitted, weather conditions, etc., and b is a height depending chiefly upon weather conditions. The const. a applies only for a given wind direction; if all the a-values are taken as vectors with respect to the source of the smoke there is obtained the so-called "ellipse of damage"—a figure that varies from this form considerably with conditions of the terrain. By treating graphically observations on SO_2 made at 12 stations over a 100-day period a curve was obtained that agreed well with calcns. based upon the formula above, the product DS is a const., showing that the concn. of SO_2 varies inversely with the distance from the source. It is claimed that this proves the usefulness of this form of "roof apparatus" in detg. smoke distribution over a given area. Formulas are proposed for detg. the amt. of SO_2 from each of 2 sources passing over a given station, but with wind currents such computations are valueless. A law connecting the amt. of damage with SO_2 content of the air is as yet unknown. The methods proposed are not to replace other ways for detg. smoke damage, but are to contribute their own share in solving such problems. W. C. Ebaugh

Chemical control of ventilation at the Holland Tunnel. S. H. Katz and H. W. Frevert. *Ind. Eng. Chem.* 20, 564–70(1928).—Concns. of CO are controlled through 14 continuous, automatic CO recorders. Tunnel ventilation is increased only when recorders show increasing concn. of CO, thus effecting a saving of power. On one day when 51,750 cars passed through the tunnel in 24 hrs. the highest CO concn. was 3.2 p. p. t. t. and the max. average for one hour was 2.2 p. p. t. t. On a normal business day only one-half of the ventilating capacity was used and max. average during any one hour was only 0.7 p. p. t. t. C. M. Salls

The use of chloropicrin for disinfection and disinfestation of clothing and dwellings. O. Galler and T. Sassiquine. *Rev. Microbiol. Epidem.* 6, 275–9(1927); *Bull. Hyg.* 3, 500(1928).—Besides those present bugs and bacteria were placed in most inaccessible places and the house was sealed. Chloropicrin was injected into the house, 5 to 10 cc. per cu. m. After 48 hrs. all bacterial cultures and bugs were killed. G. R. G.

Is Paris green a better larvacide for anopheles than naphtha or petroleum? O. Hermann, J. Kolossow and N. Lipin. *Arch. Schiffs-Tropen Hyg.* 32, 140–3(1928).—Paris green may be used only when naphtha or petroleum is inapplicable. F. K.

Malaria control for cities and towns. L. L. Williams, Jr. *Va. Med. Monthly* 55, No. 3, 198–200(1928); *Pub. Health Eng. Abstracts* E-576c, 18(1928).—There are but 2 certain measures of control for malaria, namely, adequate screening and the control of the breeding of the anopheles mosquito. Expts. prove definitely that screening, if thoroughly done, is efficacious. Drainage is the most effective method of controlling the production of mosquitoes. Undrainable places must receive a weekly dose of oil to prevent breeding during the summer season. Where anopheles only are to be stopped, it is only necessary to det. their breeding places and control them by drainage or oil. Paris green mixed with road dust (1 to 99) and cast on the windward side of a breeding area is effective. The rate of application should be 1 lb. per acre. Since *Anopheles quadrimaculatus* breeds only in water with no apparent current, quiet water ponds, pools and sluggish brooks within a mile from the town or city, must be drained or be treated with Paris green once a week. C. R. Fellers

The process of digestion in tsetse flies. H. M. O. Lester and Ll. Lloyd. *Bull. Entomol. Research* 19, 39–60(1928).—The salivary glands of the tsetse flies (*Glossina mortisans; G. tachinoides*) contain a powerful anticoagulin, which delays the clotting of the blood of mammals, birds, reptiles and batrachians. Its purpose is to prevent clotting and blood coagulation in the crop of the flies. The proventriculus and the first third of the mesenteron take no part in blood coagulation but contain the anticoagulin, which is derived from the salivary secretion. The posterior part of the mesenteron contains a powerful coagulin which neutralizes the effect of the anticoagulin and liquifies the blood food in this region. Both enzymes have the ordinary properties of enzymes, the salivary enzyme being the more stable. When mixed they probably unite to form some inactive compd. The salivary enzyme is probably so combined with some substance in the blood that its neutralization by the coagulant enzyme is delayed. It seems to take part in the formation of thrombin and to be akin to antikinase. The mesenteric enzyme (coagulin) does not affect blood from which Ca has been removed; therefore it is not like thrombin. It probably also influences the first phase of clotting, behaving like kinase. The mechanism of draining of the blood

meal is described. The Malpighian tubules function properly only when the fluid food has an osmotic pressure near that of blood. A large meal of water generally kills the fly. C. H. RICHARDSON

An examination of the efficacy of arsenical solutions in the reclamation of tsetse areas. H. L. DUKE, G. N. HALL AND E. C. HADDON. Uganda Protectorate, Africa. *Bull. Entomol. Research* **19**, 7–21(1928).—The tsetse fly (*Glossina palpalis*) can take up a toxic dose of As from an As-impregnated area by means of the proboscis. It can also remove a toxic dose from a wet or dry impermeable surface. The chance of obtaining a poisonous dose of As from the skin of a dipped animal is much less than from other types of treated surfaces. The risk is greater from the wet than from the dry skin. The use of "dummy" animals impregnated with As is discussed and seems of questionable value. Experiments to determine the effect of dipping with As-contg. solns. to rid infected animals of trypanosomiasis were inconclusive. This treatment probably tends to develop As-fast strains. Dipping with As solns. leads to a general improvement in the condition of the animal. C. H. RICHARDSON

Observations on the thermal death points of the blow-fly at different relative humidities. M. V. F. BEATTIE. London School Hyg. and Trop Med. *Bull. Ent. Research* **18**, 397–403(1928).—The thermal death point of the blow-fly (*Calliphora erythrocephala*) is definitely influenced by humidity, satd. and dry air lowering it. Relative humidities of 60–80% were more favorable and 70% was found to be an optimum point. Death in satd. air was due to the inability of the fly to regulate its body heat by evapn. Death in dry air was not explained. C. H. RICHARDSON

Mosquito breeding and malaria in relation to the nitrogen cycle. K. B. WILLIAMSON. *Bull. Entomol. Research* **18**, 433–9(1928).—The following conditions are important: (1) efficient oxidation of the products of protein lysis in the water; (2) the ratio between the oxidized and ammoniacal N; (3) the amt. of dissolved O_2 in the water; (4) presence of microörganisms which serve as food or produce disease. The p_H of the water is not of great importance. C. H. RICHARDSON

The reaction of the breeding places of Anopheles in Macedonia. (MISS) H. RUSSELL. *Bull. Entomol. Research* **18**, 155–8(1928).—The common anopheline mosquitoes of Macedonia (*Anopheles bifurcatus, A. superpictus, A. maculipennis*) breed in alk. water ranging from p_H 8 to 9.5. The local culicine mosquitoes are not so selective, being found in water ranging from p_H 6.5 to 10. The p_H of the water is often an index of the presence of anopheline larvae and so is of practical value to the anti-malaria worker. The geological formation of Macedonia is such that a study of the reaction of its natural water will be of great interest to students of mosquitoes and to sanitary engineers. C. H. RICHARDSON

Determination of H_2SO_4 in water (DOBROWSKY) **7**. Classification of saturated salt lakes (KROTOV) **8**. External corrosion of Cu and brass service pipe (LOGAN, EWING) **9**. Paralana hot spring (MAWSON) **8**. The preparation and testing of food gelatin for the bacteriological investigation of water (BEGER) **11C**. The disposal of effluents from sugar-beet factories (UNDERWOOD) **28**. Catalytic action of mineral waters (GAISSER) **2**. Metal-metal oxide electrodes (WATSON) **2**. Mixing solids with liquids such as in water purification (U. S. pat. 1,686,076) **13**.

Venturi and valve construction for controlling the flow in water-purification systems. MILTON F. STEIN (to General Zeolite Co.). U. S. 1,685,205, Sept. 25.

Mixing apparatus for purifying water by treating it with chemicals. WILSON EVANS (to National Aluminate Corp.). U. S. 1,686,078, Oct. 2.

Apparatus for purifying water by chemical treatment, settling, etc. WALTER H GREEN (to General Zeolite Co.). U. S. 1,684,822, Sept. 18.

Degasification of water. JOHN C. HOVEMAN, CHARLES R. HOVEMAN and HENRI L. F. MOUZET. Fr. 635,388, June 1, 1927. Water for certain industrial uses is submitted in the form of a fine spray to a high vacuum.

Apparatus for softening water by zeolitic material. WILLIAM J. KENNEY (to Zeolite Engineering Co.). U. S. 1,685,816 and 1,685,817, Oct. 2. Structural features U. S. 1,685,818 (not assigned when issued) also relates to a combined filter and upflow water-softening app.

Base-exchange silicates. ESKEL NORDELL (to Permutit Co.). U. S. 1,687,036, Oct. 9. Reaction is effected between Al acetate or other suitable sol. Al salt of an org. acid and a soln. of an alkali metal silicate, the gel product is partially dried, leached, broken up and screened to size for use, *e. g.*, in *softening water.*

Treating evaporator water containing scale-forming impurities. GEORGE W

SMITH (to John M. Hopwood). U. S. 1,686,715, Oct. 9. Impurities which would tend to soften the scale are removed from water, *e. g.*, by filtration to sep. suspended $CaCO_3$, etc., and the water is evapd. to such a concn. as to cause the formation of a hard scale on the heating surfaces of the evaporator; these surfaces, which may be in the form of helical brass pipe coils are periodically deformed, *e. g.*, by increase of steam pressure, to crack off the scale. An app. is described.

Use of iron silicate as a filtering medium for hot alkaline boiler waters. RALPH E. HALL (to John M. Hopwood). U. S. 1,686,558, Oct. 9. An app. is described.

Preventing corrosion and incrustation in boilers. SOC. DES PERFECTIONNEMENTS APPLIQUÉS A L'INDUSTRIE. Brit. 285,057, Feb. 10, 1927. An emulsion is formed from vegetable seed cake such as linseed cake, for use in preventing incrustation or corrosion.

Preventing incrustation in boilers. H. BREYER. Brit. 284,629, Feb., 1927. An incrustation preventive is prepd. from myrobolan, quebracho, $NaHCO_3$ and NaF.

Treating polluted acid wastes. JOHN T. TRAVERS (to Travers-Lewis Process Corp.). U. S. 1,685,300, Sept. 25. Acid wastes such as those from *mines or steel mills* are passed through porous $CaCO_3$ and maintained in contact with the $CaCO_3$ for 2–5 min. in order to avoid deposition of $Fe(OH)_3$ on the $CaCO_3$. U. S. 1,685,301 specifies the use of travertine or a $CaCO_3$ material of similar porosity. Cf. *C. A.* **22,** 2632.

Treating sewage and other waste products. AKTIESELSKABET DANSK GAERINGS INDUSTRI. Brit. 284,267, Jan. 26, 1927. Waste waters from *distilleries* and from *yeast, sugar* and other *factories* utilizing molasses are purified by the action of aerobic or anaerobic betaine-destroying microörganisms which may convert the betaine and its derivs. into CO_2, NH_3 and formic acid. In a second stage, the org. acids such as formic acid may be removed by bacterial decompn. The waste water contg. humus may also be treated with organisms which may be used in the first or second stage of the process. Albuminous substances may be removed by albumin-decompg. bacilli or by filtering and yeast cells may be removed mechanically or by plasmolysis or by heating and use of albumin-destroying microörganisms. Various details and a diagrammatic plan of app. are given.

Apparatus for treating sewage with disinfectants in "sanitary closets." EPHRAIM L. JACKSON. U. S. 1,687,336, Oct. 9.

Treating garbage. REVERE P. KINKLE. U. S. 1,684,448, Sept. 18. Garbage is subjected to the drying action of a current of hot gases and NH_3 is recovered from the gases. The dried garbage is burned and the heat produced is utilized for the drying and NH_3-recovery operations.

15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

Monolithic soil profiles. J. E. CHAPMAN. N. Dakota Expt. Sta. *Science* **68,** 299(1928).—A rapid method of taking monolithic soil profiles to a depth of 40 in. in stone-free soils is described. E. F. SNYDER

Do soil samples become more acid upon drying? WIDAR BRENNER. *Z. Pflanzenernähr. Düngung. Bodenk.* **11A,** 141–4(1928).—From a review of the literature on the influence of drying on the H-ion concn. of soil suspensions and exts., B. concludes that drying does not significantly change the p_H value of soils. R. M. BARNETTE

The laboratory for soil research. J. HUDIG AND C. W. G. HETTERSCHIJ. *Chem. Weekblad* **25,** 501–6(1928).—Descriptive. B. J. C. VAN DER HOEVEN

Theoretical viewpoints on the analyses of soil for plant nutrients. S. GERICKE. Oldenburg i. O. *Z. Pflanzenernähr. Düngung. Bodenk.* **11A,** 144–50(1928).—A critique giving advantages and disadvantages of the different methods used in arriving at the plant nutrient content of the soil—*i. e.*, Mitscherlich mathematical formulation, Neubaurer plant method and chem. methods. R. M. BARNETTE

Making a correct mechanical analysis of soils in fifteen minutes. GEORGE J. BOUYOUCOS. Mich. Agr. Expt. Sta. *Science* **67,** 587–8(1928).—A brief discussion of the points of agreement and disagreement between the hydrometer and mech. analysis methods of soil analysis. The criticisms of Joseph and Keen regarding the hydrometer method are not justified. E. F. SNYDER

Formula for the control of the apparatus used for the mechanical analysis of the soil. MIECZYSLAW JANOWSKI. *Rocsniki Nauk Rolnicsych I Lesnych* **18,** 31–7; *Chem. Zentr.* **1927, II,** 1885.—A formula is given for calcg. the height of water in the piezometer

tube of the hydraulic app. using an upward flowing water current for the mech. analysis of the soil. G. SCHWOCH

The relation between the mechanical composition and the hygroscopicity of a soil. FRITZ GIESECKE. Göttingen. *J. Landw.* **76**, 33–40(1928); cf. *C. A.* **22**, 2633.—No relation could be found between the hygroscopic coeff. and the clay content or the ratio of clay to fine silt. E. F. SNYDER

Extraction of soils by the hydrochloric acid method. E. BLANCK AND A. RIESER. *J. Landw.* **76**, 25–31(1928).—Three modifications of the method proposed by the International Commission were compared with the Commission's method and differences observed in the subsequent analyses. The method of prepn. of the soil for analysis also affected the proportion dissolved by HCl. E. F. SNYDER

Comparison between soil examinations by the seedling method and the method of Mitscherlich. H. NEUBAUER, W. BONEWITZ AND A. SCHOTTMÜLLER. Staatlichen Landw. Versuchsanstalt, Dresden. *Landw. Versuchs. Sta.* **107**, 131–42(1928).—The comparison of results of soil examns. by the 2 methods depending upon entirely different principles offers valuable suggestions for further work. One cannot, however, conclude without further work, on a failure of the seedling method, if their results in certain cases do not agree sufficiently with those by Mitscherlich. E. F. SNYDER

Soil acidity methods as applied to soil survey work. S. D. CONNER, M. F. MORGAN AND G. W. CONREY. *J. Am. Soc. Agron.* **20**, 881–92(1928).—A brief discussion of soil acidity and crop growth, soil-acidity methods and their value in soil survey work. E. F. SNYDER

Reaction of South Australia soils. JAMES A. PRESCOTT. Univ. Adelaide. *Trans. Proc. Roy. Soc. S. Australia* **51**, 287–90(1927).—The soil reactions were detd. by the technic of Biilman and Torborg-Jensen (cf. *C. A.* **22**, 1644). The results are tabulated in a form which brings out the facts as to locality, rainfall and soil reaction. . There is a limit on the acid side which is governed by rainfall conditions. Generally, acid soils do not occur with a rainfall much less than 20 in. The reaction of calcite in equil. with the CO_2 of the atm. is about p_H 8.4, which, with few exceptions, is approx. the limit of alky. of the surface soils. Many of the subsoils have a high alky. with an extreme limit of p_H 9.3. Analyses, using the method of base exchange, show that these highly alk. soils have their reactive fractions partially satd. with Na. Examn. of the aq. exts. for salt content further indicates the presence of free carbonate ions. L. W. R.

A schematic soil map of European Russia, 1927. L. J. PRASSOLOV. *Ernähr. Pflanze* **24**, 348–51(1928). LAWRENCE P. MILLER

The so-called "Tepetate" soil in Mexico. H. HELLMERS. Preuss. Geol. Landesanstalt, Berlin. *Z. Pflanzenernähr. Düngung. Bodenk.* **11A**, 112–4(1928).—The chem., phys. and microscopic examn. of a "Tepetate" soil from Hacienda Amalúcan, Mex., showed that this soil must have been formed primarily from fine volcanic sand. R. M. BARNETTE

The reaction of the soils of Württemberg. M. v. WRANGELL AND K. W. MÜLLER. *Jahresb. Ver. Vaterl. Naturk. Württemberg* **83**, 112–45(1927).—For detg. p_H 40 g. soil was mixed with 100 cc. H_2O, allowed to stand with occasional shaking for 12 hrs., and filtered, detns. being made immediately with nitrophenol indicators. The data are tabulated with respect to geological formations and soil texture. About 16% of the soils showed $p_H > 7$, 74% 6.5–7.0, 8% 6.0–6.4, and 2% $p_H < 6$. The p_H varied from month to month, the max. difference, 1.6 p_H unit, being shown by a sandy loam. The presence or absence of single plant species is not a safe guide for judging reaction, as the supposedly acid-soil plant, sorrel, was found growing with neutral-soil clovers in a soil of p_H 6.7. A loam soil of original p_H 6.5 was brought to various values with H_2SO_4 and CaO, and used for growing 8 crops. The optimum yields were obtained for: oats and rye at p_H 5–6; barley, wheat, peas and red clover, p_H 6–7; sugar beets and corn, p_H 8 (falling to 7.5 toward the end of the expt.) Suggestions of bimodal curves were obtained with some of these. Except for isolated cases injury by soil acids and alkalies is not to be expected in this province. E. T. WHERRY

Chemical soil analysis and molecular proportion. K. UTESCHER. Geologischen Landesanstalt, Berlin. *Z. Pflanzenernähr. Düngung. Bodenk.* **11A**, 265–81(1928).—As the mol. proportions of the SiO_2: Al_2O_3: bases in clay as detd. by the methods used at the Geologischen Landesanstalt in Berlin have been criticized by numerous investigators who failed to obtain the mol proportions as found at the Berlin institute, U. has made a critical examn. of the methods used by other workers and shows that the method of making the HCl extn. (*i. e.*, heating on water bath or with reflux condenser) makes a great difference in the calcn. of the mol. proportions and gives results which are not comparable with those obtained in the Berlin institute. The methods used at the

Preuss. Geologischen Landesanstalt are definitely and accurately described so that they may be available to other workers. R. M. BARNETTE

The chemical determination of soil fertility. K. BAMBERG. Universität, Riga. *Z. Pflanzenernähr. Düngung Bodenk.* 11A, 115–41(1928); cf. *C. A.* 22, 294.—The soly. of soil phosphates, Al_2O_3, Fe_2O_3 and org. matter in HNO_3 and citric acid of varying concns. was increased by drying. The soly. of $Ca_3(PO_4)_2$ (Kahlbaum) and $AlPO_4$ (Kahlbaum) was greater in HNO_3 than in citric acid at the same H-ion concn. $FePO_4$ (Merck) was more sol. in citric acid. From a comparison of the Mitscherlich method, the Neubauer plant method and the soly. of soil P_2O_5 in HNO_3 (adjustment of soils to an end p_H of 2) and in neutral ammonium citrate, it is maintained that in soils with a low P_2O_5 content all three methods give a satisfactory agreement, but in soils with a high P_2O_5 content the Neubauer method gives low results and that better agreement is obtained between the Mitscherlich and the chem. methods. The soly. of soil K_2O is dependent upon the end p_H which is obtained with the different acids. The anion of the acid does not influence greatly the soly. of the soil K_2O; however, the H-ion concn. of the original soil does influence the results. A comparison of the Mitscherlich figures with those obtained by the Neubauer plant method and chem. methods (K_2O sol. in HNO_3 at an end p_H 2, or in 1 or 2% ammonium citrate, or 2% ammonium acetate) shows that the Neubauer method agrees closely with the chem. methods, while the Mitscherlich procedure gives low results. From a comparison of field observations with chem. analyses (soly. of soil K_2O and P_2O_5 in acid) it is maintained that valuable information relative to the response of soils to applications of fertilizer salts can be obtained. R. M. BARNETTE

Acidity of moorland soils. B. TACKE, P. ARND, W. SIEMERS AND J. SAFFRON. *Landw. Jahrb.* 65, 66–103(1927); *Biederman's Zentr.* 57, 7–8(1928).—The Tacke-Süchting method shows no exchange acidity in moorland soils. Results indicate a decompn. of neutral salts by soils rich in org. matter. Liming effects a 50% neutral salt decompn. Decompn. is influenced by the nature of both ions. The resistance to decompn. is of the following order, chlorides, nitrates and sulfates. G. R. G.

The exchange acidity of soils formed by the weathering of igneous rocks. RUDOLF PUERCKHAUER. Hochschule Weihenstephan. *Z. Pflanzenernähr. Düngung Bodenk.* 11A, 359–98(1928).—In this investigation, all the soils formed from the weathering of igneous rocks were acid under uncultivated conditions. Under the influence of cultivation and culture the top soil showed a tendency to be less acid than the uncultivated conditions, though the av. of a large no. of detns. on different soils showed that this tendency was not great. The av. p_H value of KCl exts. was 4.91 ± 0.572. The av. p_H value of the subsoil at different depths of sampling was almost the same for the different depths. An av. of 508 detns. was p_H 4.48 ± 0.25. Despite this fact, in individual cases certain factors changing the acid character of the subsoil could be detected. The reaction of these soils is not influenced to any great degree by their orthographic position, the depth of the weathered layer, nor the stone or clay content. These soils under a forest growth show a greatly increased acidity even in the lower depths. This increased acidity in the lower depths persists long after the soils have been brought into culture. A difference in reaction due to the utilization of the soils for meadows or culture could not be detected. Differences which were encountered were founded in the different fertilizer practices which were followed. Correct use of the soil for pasture seemed to have a favorable influence on the reaction. Utilization of these soils for gardens leads to a significant change in the reaction of even the lower depths toward the alk. side. Physiologically acid fertilizers on these soils played a very subordinate role in changing the reaction. Lime changed the reaction significantly as did also stable manures. The buffer content of these soils is low. The garden soils had the highest content of buffering materials. Clover grew satisfactorily on these soils even under p_H 4.5. R. M. BARNETTE

Acid properties of artificial and soil permutites from which the bases have been removed. W. U. BEHRENS. Univ. Koenigsberg i. Pr. *Z. Pflanzenernähr. Düngung Bodenk.* 11A, 281–7(1928).—From a study of a permutite (Permutit A.-G., Berlin), treated with CH_3COOH to remove the Na together with the untreated Na permutite and combinations of the 2 permutites in their reaction with different concns. of KCl, B. concludes that the acid permutite may be considered an acid permutitic acid as it contains H, can split off H ion and shows a titrable acidity. The H-ion concns. of mixts. of Na permutite and permutitic acid were measured and it was found that the p_H value depends upon the electrolyte content (in this case KCl) of the soln. The permutitic acid has about the same dissocn. const. as carbonic acid. The corresponding acid combinations of the soil are generally somewhat stronger than that of the permutite.

The phenomena of treating a permutite or soil with a neutral salt soln. may be explained on the basis of the law of mass action and soly. laws without the use of the "adsorption" ideas. R. M. Barnette

Adsorption phenomena in acid soils. Walter Hillkowitz. Landw. Hochschule, Bohr-Poppelsdorf. *Z. Pflanzenernähr. Düngung Bodenk.* **11A**, 229-64(1928).—For the study of the influence of the H-ion concn. on the adsorption of certain cations and of phosphates, soils of different replaceable base content were prepd. by treating an almost neutral soil with 0.1 *N*, 0.4 *N*, 0.2 *N* and 0.01 *N* HCl and the soils subsequently washed free of chlorides. From analyses of the exts. it was ascertained that only the 0.1 *N* HCl attacked perceptibly the zeolitic complex of the soil (manifested by the Al in soln.). The titrable acidity by the Daikuhara-Kappen method increased with the increased removal of bases from the soil; *i. e.*, after treatment with the different concns. of HCl. Adsorption of K from KCl and NH_4 from NH_4Cl decreased with an increase in the removal of cation from the zeolitic complex, *i. e.*, with increased H-ion concn. of soil; however, adsorption of Ca from $CaCl_2$ increased with an increase in H-ion concn. of the soil showing that the adsorption was probably an exchange reaction between the cation of the salt and the Ca of the soil (in case of Ca absorption between the Ca of the $CaCl_2$ and the Al of the zeolitic complex). The adsorption of P_2O_5 from $Ca(H_2PO_4)_2$ increased with the increase in H-ion concn. in consequence of the formation of difficultly sol. phosphates, *i. e.*, Al phosphates. However, the adsorption of P_2O_5 from $(NH_4)_2$-HPO_4 was greatest in the untreated (less acid) soil because of the formation of difficultly sol. phosphates, $Ca_3(PO_4)_2$. The increase in the removal of bases from the soil decreased the buffer capacity of the soil to acids. A study of permutite following the same line of thought gave results which substantiated the soil results. After treatment with acids for the removal of bases (cations) and a neutralization to restore the bases, the adsorption of bases by the soil does not reach the amts. in the untreated soil or permutite, showing that the treatment with acids has partly disintegrated and removed the zeolitic complex. Analyses of acid-treated permutites substantiated this finding. The different methods for the detn. of the replaceable bases were compared and the method of Gedroiz-Hissink was found to be the most reliable. A method for the estn. of the replaceable CaO in $CaCO_3$-free soil by shaking 100 g. of soil with 250 cc. of *N* KCl soln. for 1 hr. and filtering, detg. the CaO in 125 cc. of the filtrate and multiplying by the factor 2.5 gave relatively satisfactory results when compared to results obtained by the Hissink method. By treatment of 50 g. of soil with 250 cc. 0.1 *N* HCl, shaking for 1 hour, filtering after 24 hrs., titrating 125 cc. of the filtrate with 0.1 *N* NaOH with phenolphthalein as an indicator, the "neutralization power" of the soil was detd. By expressing this power in mg. equivs., the total replaceable base content is detd. for acid soils and soils contg. no $Ca_3(PO_4)_2$ and $CaCO_3$. By due calcn. of the bases combined with the phosphate and as $CaCO_3$, the method gives satisfactory results with soils contg. phosphates and carbonates. R. M. Barnette

The significance of soil respiration in the carbon dioxide feeding of plants. P. Hasse and Z. Kirchmeyer. *Z. Pflanzenernahr. Düngung Bodenk.* **10A**, 257-99(1928).—Contrary to the findings of Lundegårdh (*C. A.* **22**, 292), the authors could not ascertain a significant variation of the CO_2 content of the air in various heights in and above the plants, during the day or in the night. No significant influence of the CO_2 from the soil could be detected. $^4/_5$ of the CO_2 set free from a soil planted to lucerne can be attributed to the respiration of the roots. An improved app. for *measuring the CO_2* content of the air is described. R. M. Barnette

Does the supply of soluble plant nutrients change in unfertilized and fertilized soils during the period of vegetation? H. Neubauer, W. Bonewitz and A. Schottmueller. Landwirtschaftlichen Versuchsanstalt Dresden. *Z. Pflanzenernähr. Düngung Bodenk.* **12A**, 108-14(1928).—Soils unfertilized and fertilized with different chemicals and stable manure were subjected to a period of incubation at an av. warm temp. (in green-house) and at an av. cold temp. (in cellar). Samples were taken for the Neubauer method for testing the sol. K_2O and P_2O_5 after 57 days of incubation and at intervals after this time. There was no significant difference in the quantities of K_2O and P_2O_5 taken up by the seedling in the soils held at the different temps. at the initial sampling nor subsequent samplings. The utilization of the K_2O applied to the soils was very high in all cases. It was better in the light than in the heavy soil. Fertilization with superphosphate increased the utilization of the added K_2O. Thomas meal decreased the utilization of added K_2O as well as soil K_2O. The utilization of the K_2O in manure was very large, 92 to 99% of the quantity applied being recovered in the seedlings. Also a larger % of the P_2O_5 applied in manure was absorbed by the seedlings than from any other P_2O_5 fertilization. Added K_2O had little or no influence

on the utilization of P_2O_5 added as superphosphate or Thomas meal. The P_2O_5 of superphosphate was utilized to about the same degree in both the heavy and light soil; on the other hand the P_2O_5 of Thomas meal was utilized better in the light soil than in the heavy soil. Further expts. with KH_2PO_4, beer barm and manure on a heavy soil, a light soil and sand gave a utilization of all forms of P_2O_5 and K_2O in the descending order sand, light soil, heavy soil. The P_2O_5 and K_2O in beer barm are readily utilized.
R. M. BARNETTE

Soil reaction and its influence on the results of the Neubauer method. B. DIRKS. Universität Halle, S. *Z. Pflanzenernähr. Düngung Bodenk.* **12A,** 65–95(1928).—The satn. curve of KCl exts. of zeolite-contg. as well as zeolite-free sandy soils were detd. before and after boiling. Zeolite-free soils give curves which agree closely before and after boiling. Zeolite-contg. soils give curves which deviate widely before and after boiling up to a p_H value 8–8.3, after which the curves of the boiled and unboiled suspensions tended in the same direction and lay closer together. From this, the zeolite content of a soil can be estd. by the amt. of lime water necessary to bring a boiled sample of the soil suspended in a KCl soln. to a p_H value of 8–8.3, while the p_H values before the boiling give no sharp limits of the amt. of lime necessary. Raising the p_H value over 8.3 may be brought about by $CaCO_3$ and by alkali carbonates. Soils were adjusted to p_H values varying between 2.9 and 9 by treating with acid or lime as required. The Neubauer plant method was used to study the absorption of P_2O_5 and K_2O from the soil by the seedlings increased from the lower p_H values up to a p_H value of about 6; from p_H 6 to 8.3 there was no significant difference in the absorption; however, at a p_H value higher than 8.3 there was a decrease in the absorption of the K_2O and P_2O_5. The absorption curve of K_2O and P_2O_5 in relation to the p_H values showed a distinct max. between 6 and 8.3. Without considering the lower absorption of K_2O and P_2O_5 by the seedlings in the extremely acid soils, D. attributes the lower absorption in the alk. range (above 8.3) to the presence of carbonate in the soil soln. By drying and heating to 80–100°, the sol. carbonate decreased and a subsequent increase in K_2O and P_2O_5 absorption at p_H values higher than 8.3 occurred. This can best be detected by boiling a KCl ext. of the soil. The shrinkage of the colloidal material of the soil upon drying cannot be the cause of the increased soly. of K_2O and P_2O_5. R. M. BARNETTE

The influence of pulverizing and drying of soils on their productivity. A. ACHROMEIKO. Landw. Akademie, Moskau. *Z. Pflanzenernähr. Düngung Bodenk.* **11A,** 65–89(1928); cf. *C. A.* **22,** 2427.—The H_2O-sol. P_2O_5, org. and mineral matter, nitrates and H-ion concn. of differently pulverized and dried soils were detd. in a 3-min. extn. of 200 g. of soil with 400 cc. of distd. H_2O. Changes in the degree of dispersion were observed by using the Robinson method. Detns. were made on soil handled in the following ways: (1) natural moist soil, (2) natural soil dried in the sun, (3) natural soil dried at 100–110° in the thermostat. The changes in the sol. P_2O_5, sol. org. and mineral matter and H-ion concn. do not depend upon the non-capillary porosity of a soil; the degree of the dispersion of the pulverized soil was higher than that of the natural soil, which in turn was higher than that of the soil with the crumb structure. Drying the soils in the sun increased the water-sol. P_2O_5, org. and mineral matter content of soils; alternate wetting and drying increased these sol. constituents more than a single drying. The drying decreased the amts. of nitrate. Drying in the thermostat and sterilization with steam in the autoclave increased the soly. of these constituents more than did drying in the sun. The sol. P_2O_5 and org. and mineral materials diminished by keeping the previously dried soil in a moist condition. The amt. of nitrates increased with this treatment. The action of high temp. on the soil was to increase significantly its acidity. By maintaining soils dried in this manner in a moist condition, the H-ion concns. of water exts. and suspensions decreased, which decrease is dependent upon the activity of the soil microörganisms, as such a change did not occur under sterile condition or in the presence of antiseptic media. The increase in soil acidity caused by heating the soil to the higher temps. is correlated with increases in the amts. of sol. acid org. matter. Previously dried soils which were moistened and kept under sterile conditions showed no change in the sol. org. matter, but the soly. of the P_2O_5 decreased very markedly. Drying increased the degree of dispersion of the org. matter of the soil, but decreased the degree of dispersion of the mineral portion of the soil. Drying in thermostats was equally active in increasing the degree of dispersion of the org. part of the soil and decreasing the degree of dispersion of the mineral portion; however, the sun was more active in decreasing the degree of dispersion of the mineral portion than in increasing that of the org. portion. By wetting the dried soil it returned to the state of aggregation, which it showed before drying. R. M. BARNETTE

The significance of the absorptive power and the water-conducting ability of the

soil for plants. HANS GRADMANN. *Ber. deut. botan. Ges.* **46**, General Meeting Number, 68-73(1928).—Plants through their own absorptive power can overcome to some extent the absorptive power of the soil and the resistance to the movement of water through the soil. Different types of soil give up different amts. of water under conditions of increased suction. These factors should not be overlooked in ecology. L. P. M.

The determination of the organic, especially the humified, substance in soils. ULRICH SPRINGER. Geol. Landesuntersuchung am Oberbergam, München. *Z. Pflanzenernähr. Düngung Bodenk.* **11A**, 313-59(1928).—From a critical examn. of the different methods of detg. the org. matter of soil, S. maintains that the CrO_3 method as modified by him gives results which agree closely with the complete elementary oxidation of the org. matter by the combustion method. The method consists in the wet oxidation of the soil org. matter with 3.3 g. CrO_3, 10 cc. water and 50 cc. of H_2SO_4 to .1-20 g. of soil. The gases are passed over a tube contg. CuO and lead chromate to insure a complete oxidation; subsequently the gases are washed in concd. H_2SO_4 or passed over $CaCl_2$ for drying before absorption in KOH. The danger of the application of a factor for the conversion of CO_2 (or C) into org. matter is shown by the difference in the C content (cellulose 44.4% C, lignin 55.5% C, pectin about 40% C, humic acid 57.5-60% C, acidum hum. (Merck) 59.77% C, Kasseler brown 62.0% C) of the heterogeneous org. matter of the soil, and S. recommends, therefore, that the C content be always given in addition to the calcd. % of org. matter. For the estn. of the humified substance, the extn. with ammonia, pyridine, etc., gives very unsatisfactory results. Extn. with 5% NaOH and oxidation of the humified substance with $KMnO_4$ have given better results than other methods. The use of 5% soda soln. gives low results, but gives more satisfactory results than the NaOH extn. if colorimetric methods are used. The NaOH decomposes the humic acid and decreases the color intensity of the ext. Uncertainty of the colorimetric method due to its dependence on definite standard prepns. which might or might not be present in the ext. is emphasized. The method of Lapicque and Barbé and the H_2O_2 method do not estimate the humus content of the soil but do give valuable information relative to the easily oxidizable org. matter of the soil. The purification of the humified substance in the soil by the extn. of plant residues and intermediate decomposition products from the soil by AcBr and subsequent detn. of the humified substances in the residue (*i. e.*, by wet combustion method above) is thought to be the most satisfactory method. 45 references are cited. R. M. B.

The chemistry of the organic substances of the soil. A. SHMUK. *Abhandl. Kuban. Landw. Inst.* *Teil I, Lfg. 2*, **1923**, 1-91; *Biedermann's Zentr.* **56**, 289-91; *Chem. Zentr.* **1927**, II, 1389.—The paper contains first a survey of the org. substances existing in the ground and of their compn. In the 2nd part, S. goes into detail about the compn. of the humic acid. According to his investigations, it contains about 14% resinic acids and esters, and about 80% humic acid. The latter is of acid character and contains hydroxyl as well as carboxyl groups. Analysis as calcd. for the ash-free substance gave C 61.8, H 4.2 and N 3.2%. The ash is not bound organically. N is present in the form of the ordinary protein compds. The approx. formula is $(C_6H_4O_3)n$. G. SCHWOCH

Composition of natural organic materials and their decomposition in the soil. III. The influence of nature of plant upon the rapidity of its decomposition. SELMAN A. WAKSMAN AND FLORENCE G. TENNEY. New Jersey Agr. Expt. Sta. *Soil Science* **26**, 155-71(1928); cf. *C. A.* **22**, 1424.—A study was made of the influence of the compn. of plants on decompn. processes and their modification by addition of available nutrients to plant materials. Plants were selected which have a marked variation in compn. Materials used were rye straw harvested as hay, mature corn-stalks, mature oak leaves, stems and leaves of alfalfa tops, pine needles and moss. In most plants, especially when they are mature, there is a lack of balance between the available carbohydrates and the available N and minerals required by the microörganisms which bring about the decompn. of the plant. In those cases, the presence of additional inorg. nutrients greatly hastens the decompn. processes. A number of other factors, such as nature of microflora and microfauna active in the decompn., proper aeration and soil reaction, modify the rapidity and nature of decompn. of the plant material. These factors influence the rate of evolution of CO_2, the amt. of soil org. matter resistant to decompn. that is formed, and the rapidity of liberation of N and of mineral plant constituents. J. J. SKINNER

The coagulation of the soil. L. SMOLIK. *Vestnik Ceskoslov. Akad. Zemedelske* **1926**, 221; *Biedermann's Zentr.* **56**, 193-4; *Chem. Zentr.* **1927**, II, 1389.—The colloidal state of the soil depends on temp., content of electrolytes and tilling. In this study the variability of the total surface with different temps. was examd. The hygroscopicity was detd. according to Mitcherlich, the activity of the catalase according to Koenig.

By air-drying, the soil lost 11-15% of the active surface, and the activity of the catalase decreased. Continual frost had no noteworthy action. G. Schwoch

Determination of the quantity and "quality" of colloids in soils. G. W. Conrey. Ohio Agr. Expt. Sta. *J. Am. Soc. Agron.* **20**, 893-9(1928).—The importance of a detn. of a quantity of colloids in connection with mech. analysis is stressed and the possibility of its substitution for that of the clay-fraction detn. is suggested. In detg. the quantity of colloids the ratio methods are apparently the best available at present. The importance of the quality factor is stressed and further study is necessary to det. what detn. will serve best to characterize the quality of the colloid. E. F. Snyder

Colloidal behavior of soils and soil fertility. IV. Anion effect on the precipitation reactions and degree of dispersion of aluminum and iron hydroxides. J. S. Joffe and H. C. McLean. N. J. Agr. Expt. Sta. *Soil Science* **26**, 47-59(1928); cf. *C. A.* **20**, 639, 1295, 2039; **21**, 4002.—In the presence of the SO_4 anion all of the Al from a 0.0075 *M* soln. is transformed into the gel at p_H 4.7 to 4.8. No sol state of Al exists in the presence of SO_4. The complete pptn. of Fe of the same molar concn. in the presence of SO_4 anions takes place at the zone of p_H 3.2 to 3.8. There is a sol state of Fe under the influence of SO_4 which is transformed into the gel state upon removal of electrolytes by dialysis. In presence of the Cl ion complete Al pptn. from a 0.0075 *M* soln. takes place at p_H 5.4. Molecularly dispersed Al may persist almost to the point of complete pptn. Fe colloid gave similar results with the Cl ion. Molecularly dispersed Fe disappears as soon as the gel appears. Removal of electrolytes does not convert Fe sols into gels in the presence of Cl anions. NO_3 causes complete pptn. of Al at p_H 5.8 to 6.0, and of Fe at p_H 5.4. The NO_3 anion produces similar results to those obtained with Cl. In mixts. of anions the bivalent and tervalent anions control the states of aggregation of the Al and Fe colloids. Under normal soil conditions inorg. ions preclude the presence of Al and Fe in soln. Al may be in soln. from the dissocn. of Al silicate complexes in the soil. Iron is probably supplied to plants by the dissolving action of org. acids or other org. solvents. A. L. Mehring

Some physicochemical effects of organic soil colloids. Walter F. Loehwing. State Univ. of Ia. *Proc. Iowa Acad. Sci.* **34**, 149-52(1927).—An investigation undertaken to det. the reason for injurious effects of lime to grains grown on certain acid org. soils which occur in the Great Lake region. Analyses were made of the soils and crops to det. if a harmful phys. change occurred in the soils after liming or if lime was chemically injurious. Results seem to indicate that decreased potash assimilation is coupled with change from acidity to alky. in the soil or with release by replacement of some toxic substance. The latter is a possibility in this case as the soils contained moderate amts. of Fe, of which toxic quantities were liberated by liming. Clover maintained a const. supply of potash whether soils were limed or not. The best yields of clover were on limed soils. This shows a difference in nutrient requirement or absorptive capacity of roots. Because of the difficulty of securing dispersal of colloidal material, especially in org. soils, much work of the type here reported is open to question. Yet it appears that lime used to correct acidity and improve tilth on org. soils deficient in potash induces profound phys. and chem. changes in the soil which may be more objectional than the original acidity. With grains the injurious effect of lime is due to diminished K intake. Use of potash following lime injury to grains does not restore the yield on org. soils as it has been known to do on mineral soils The response of crops to lime differs according to their nutrient requirements and absorptive ability. W. G. Gaessler

The hydrogen ion concentration of some Porto Rican cane soils. E. J. Colon. *Facts About Sugar* **23**, 617-8(1928).—The p_H and CaO contents of various types of soil in one district of the Island were detd. From the results and from observations and reports on liming it is tentatively assumed that a soil p_H of 6.7 to 7 and a soil content of 0.3 to 0.4% available CaO by 1% citric acid is indicative of a good reaction, and around 0.03% CaO in the cane juice as a sufficiency of lime. J. F. Brewster

The work of Arrhenius on the Java cane soils. O. W. Willcox. *Facts About Sugar* **23**, 854-9(1928); cf. Arrhenius, *C. A.* **21**, 1830, 2350, 2351, 2569, 3411, 3414; **22**, 131, 132, 475, 1003, 2285, 2286; Bennett and Allison, *C. A.* **22**, 2804.—The work of A. for the Java Sugar Syndicate is reviewed and compared with the work of B. and A. on the soils of Cuba. Arrhenius' method of mapping soils on the basis of p_H, phosphates, and nitrification is contrasted with the American soil-type method. The article is illustrated with typical soil maps and with curves comparing percentage areas of sugar beet and cane lands classified according to soil p_H; cane growth plotted against the p_H of clay soil and of light soil; Ca phosphate plotted against p_H; and a relation between the nitrifying power of soil and the $(NH_4)_2SO_4$ requirement. M. J. P.

Results of soil analyses of a number of (Java) sugar mills. O. ARRHENIUS. *Arch. Suikerind.* **36**, III; *Mededeel. Proefsta. Java-Suikerind.* 807–20(1928); cf. *C. A.* **22**, 4195.—The soils of 13 mills were analyzed for p_H, P_2O_5, and nitrate production, and the soils of 5 of the mills also for Cl. The results are given in tables and maps. The principal advantage of soil analyses is that the field expts. will be more efficient and time will be saved, but cultural advice based on chem. analyses alone is not reliable. The variations in the soil are usually so great that samples must be taken short distances apart. The time for which the maps retain their usefulness is 8–10 yrs. in the case of p_H and P_2O_5, provided that the equil. is not disturbed by liming. The maps for nitrate production must be revised every 3 or 4 yrs., and the Cl detns. are of value only for the time at which the sample was taken. P. R. PEKELHARING

The estimation of iodine in soils. ROLAND V. NORRIS AND D. A. RAMA RAO. *J. Indian Inst. Sci.* **11A**, Pt. 7, 75–9(1928).—The method of Hercus, Benson and Carter (*J. Hyg.* **24**, 321(1924)) was tested on soils to which known amts. of I were added and was found unsatisfactory. Expts. with pure quartz sand to which I and Fe had been added indicate that the unsatisfactory results obtained were due to the Fe content of the soil. The method finally adopted is as follows: "The combustion of the air-dried soil is carried out in a Ni boat about 10″ long in a SiO_2 combustion tube in a stream of O. For soils rich in I 5 g. can be used, the quantity being increased if the figure is likely to be low. The combustion tube is heated to about 850° in a simple type of elec. furnace. One end of the tube is drawn out to a fine point which is bent over and passes directly into the absorption vessel contg. a small quantity of 10% NaOH. It is not necessary to use any cooling coil as suggested by McClendon. The combustion is continued for one hr., by which time all the I present in the sample will have been driven over into the alk. soln. The latter, together with the washings of the absorption vessel, is then transferred to a 100-cc. stoppered bottle and neutralized by the careful addition of H_2SO_4; 2 cc. of CCl_4 is added and the I liberated from the iodide by the addition of 3–5 drops of nitrosulfuric acid, prepd. by heating concd. HNO_3 with starch and absorbing the nitric oxide fumes in H_2SO_4. After vigorous shaking the CCl_4 contg. the I is sepd., washed twice with a very small quantity of H_2O and freed from acid by adding 2 cc. of $NaOOCCH_3$ solution. The I is then titrated with $N/1270$ $Na_2S_2O_3$. If necessary a second extn. with CCl_4 may be made. The $Na_2S_2O_3$ soln. is kept in the dark and standardized at frequent intervals." By this method 5 parts of I per 10 million can be detected and greater amounts estd. in a sample of 25 g. H. R. KRAYBILL

The cause of nitrification in Hungarian Szik (alkali) soils. F. ZUCKER. Tech Hochschule, Budapest. *Z. Pflanzenernähr. Düngung Bolenk.* **12A**, 102–7(1928).—Hungarian alkali soils were tested for their capacity to nitrify the NH_3 in an $(NH_4)_2SO_4$ soln. by inoculating a sterile $(NH_4)_2SO_4$ soln. with a small quantity of the soils. Liming increased the rate of nitrification of $(NH_4)_2SO_4$ in the limed alkali soils of Karczag in comparison with similar but unlimed soils of Nagyhortobágy, Ujszász, Tiszasas and Püspökladány in which nitrification of $(NH_4)_2SO_4$ occurred only in a few samples. The action of lime in increasing the nitrification in the Karczag soils extended to the lower depths. The increase in nitrification brought about by liming is attributable to greatly improved phys. properties, *i. e.*, increased aeration. The correlation of nitrification with weather conditions, aeration, etc , of these alkali soils is being studied. R. M.

Relation of climatic factors to the amount of nitrogen in soils. HANS JENNY. Univ. of Missouri. *J. Am. Soc. Agron.* **20**, 900–12(1928).—Analysis of soil samples coming from a wide climatic range shows that the total N content of the soil decreases in the United States from north to south in relation to temp. The change of the N content with temp. is a negative exponential function, provided the rainfall-evapn. ratios are const. For every 10° fall in mean annual temp., the av. N content of the soil increases 2 to 3 times. Practical aspects of the investigation, such as the maintenance and the increase of org. matter and N in the soil, are discussed. E. F. S.

The relation of exchangeable cations to the physical properties of soils. L. D. BAVER. Ohio Agr. Expt. Sta. *J. Am. Soc. Agron.* **20**, 921–41(1928).—The Ca ion produced no significant effect on the moisture equiv., hygroscopic coeff., and heat of wetting. It had a marked flocculating action on soils contg. a high % of clay. It had a tendency to increase the plasticity no. of the soil. No significant change in the moisture equiv. value was produced by the K ion. It decreased the hygroscopic coeff. detd. over 2% and 3% H_2SO_4 as well as the heat of wetting and had a deflocculating effect on the soil suspension. It lowered the plasticity no. of all the soils. The H ion showed no effect on the moisture equiv., hygroscopic coeff., and heat of wetting. It caused a decrease in the state of flocculation of the soil suspension. In soils highly satd. with bases it decreased the plasticity no. The plasticity no. was increased in soils

with a low degree of satn. The Mg ion showed no marked effect on the moisture equiv., hygroscopic coeff., or heat of wetting. It decreased, with one exception, the state of flocculation and had a tendency to increase the plasticity no. The Mn ion produced no significant effect on the moisture equiv., hygroscopic coeff., and heat of wetting. It produced a strong flocculating action below the neutral point. There was a slight tendency towards an increase in the plasticity no. Because of the highly puddled condition of the soil, the Na ion increased the moisture equiv. It decreased the hygroscopic coeff. as detd. over 30% H_2SO_4, as well as the heat of wetting. It caused a deflocculation of the soil suspensions and increased the plasticity no. of the soil by lowering the lower plastic limit. E. F. SNYDER

The application of the antimony electrode to the determination of the p_H values of soils. E. F. SNYDER. U. S. Dept. of Agr. *Soil Science* **26**, 107–11(1928).—In soil suspensions the Sb and H_2 electrodes showed very good agreement on soils ranging from p_H 3.6 to 9.2. Constant and reproducible potentials were generally obtained in about 1 min. The prepn. of Sb electrodes and the electrometric detn. are described. E. F. SNYDER

The significance of the hydrogen-ion concentration in soil nitrification studies. HARRY HUMFELD AND LEWIS W. ERDMAN. Ia. Agr. Expt. Sta., Ames. *Proc. Iowa Acad. Sci.* **34**, 63–6(1927).—Data are presented which show the relation of the reaction of the soil or its H-ion concn. to its nitrifying capacity. The initial reaction of the soil varied from as low a p_H as 5.16 to as high as 7.18. Indications are that nitrification goes on until a p_H of 4.4 to 4.8 is reached while from then on it proceeds slowly. Whenever the final p_H is below 4.2 the amt. of $(NH_4)_2SO_4$ nitrified is small. The data show that when $CaCO_3$ is added nitrification is increased considerably. The final reaction of the soil is somewhat more acid than the initial reaction, which seems to indicate that a somewhat larger amt. of $CaCO_3$ than the theoretical amt. is necessary completely to neutralize the acidity produced. On the whole, there is a close correlation between the soil reaction and the amt. of $(NH_4)_2SO_4$ nitrified. W. G. GAESSLER

The significance of hydrogen-ion concentration for the cycle of nitrogen transformed in the soil. CARSTEN OLSEN. *Compt. rend. trav. lab. Carlsberg* **17**, No. 8, 21 pp.(1928).—From these results it is evident that *ammonification* can proceed in soil whose p_H values lies between 3.7 and 9.0, and that this process proceeds most actively in soil whose p_H value lies between 7.0 and 8.5. Nitrification can proceed in soil whose p_H value lies between 3.7 and 8.8. When the soil is found to be rich in NH_3 the activity of the process increases from a value of 3.7 with the increasing p_H value of the soil to a p_H value of 8.3, at which the process has its optimum. From this point the activity of the process decreases very sharply with rising p_H values of the soil. In soil whose p_H value lies between 4.0 and 8.0 *nitrification* will under natural conditions generally be limited by ammonification, and the rate of the latter process will det. the rapidity of the process of nitrification. In strongly acid soil which is rendered alk. by the addn. of $CaCO_3$, there takes place very rapidly a powerful nitrification unless it is necessary to add inoculating soil from an alk. reacting soil. Providing the nitrifying bacteria working in the acid soil are special kinds which cannot work in alk. soil, the bacteria working in the alk. soil must either be found in slight quantities in the originally acid soil or appear spontaneously with dust. The nitrifying organisms are not killed when the soil in which they appear is air-dried at ordinary room temp. These organisms can be distributed as dust from one locality to another. E. F. SNYDER

The nitrogen-fixing microörganisms of an arid soil. E. G. CARTER AND J. D. GREAVES. Utah Agr. Expt. Sta. *Soil Science* **26**, 179–91(1928).—A study of the physiol. activities of the microörganisms of an arid soil from the Naphi Expt. Farm, Utah, indicates that 26 of the 27 studied are N-fixing organisms. Most of the cultures hydrolyze starch rapidly; 10 out of 27 reduced nitrates to nitrites with varying ability. J. J. SKINNER

The sulfur cycle in soil. AUGUST RIPPEL. Univ. Göttingen. *J. Landw.* **76**, 1–10(1928).—It must be again emphasized that the results are of a tentative nature, but they show clearly enough that it is absolutely necessary in the future to pay more attention to the different stages of the S cycle. That is also true for the fixation of S as organically bound S of humus substances, and further for the gradually, although as has been shown apparently slowly proceeding mineralization, since the largest part of the soil S occurs in the organically bound form. It is further true for the other behavior of sulfates in soil. In contrast to N they are worked up by the green plants only to a small part to organically bound S. Also the sulfates in the soil not worked up by the plants are assimilated by microörganisms in the presence of sufficient C compds., gradually fixed analogous to the organically bound N. It is especially important also,

over the pure culture of oats on the raw phosphate cultures. The mustard and oat combination showed an increase in the yield of the oats of 113% over the pure oat culture in the raw phosphate series. The yields of millet on raw phosphate were increased 103 and 856% by seeding with buckwheat and lupine, resp. Analyses of the solns. drawn from the cultures showed a higher H-ion concn., a lower Ca content and a higher P_2O_5 content in the cultures planted to buckwheat, mustard and lupine than in those from cultures planted to oats and millet alone. It is concluded that the difference in the utilization of raw phosphate by the different plants is due to the difference in the absorption of Ca and the difference in the action of the plants on the reaction of the soln. A difference in the absorption of P_2O_5 plays no significant part in this varied action of the several plants. R. M. BARNETTE

The relative solubility of phosphate and potash in German and tropical soils. H. VAGELER. Königsberg i. Pr. *Z. Pflanzenernähr. Düngung Bodenk.* **11A,** 89–93(1928).—For a comparison of the soly. of P_2O_5 and K_2O in German and tropical soils, 12 of each such soils were tested by detg. the soly. of the P_2O_5 and K_2O in HCl (concn. not given) and by the Neubauer plant method. Approx. 26.2% of the K_2O sol. in HCl was recovered by the Neubauer method for the German soils, while in the tropical soils 48.8% of the K_2O sol. in HCl was recovered by the plant method, despite the fact that the content in HCl-sol. K_2O was significantly higher in the German soils than in the tropical soils. In contrast to K_2O, the soly. of P_2O_5 in the tropical soils is proportionally less than in the German soils by the Neubauer tests (3.2% of the HCl-sol. P_2O_5 for tropical soils against 6.6% of the HCl-sol. P_2O_5 for German soils. At the same time the content in HCl-sol. P_2O_5 is significantly higher in tropical soils. R. M. BARNETTE

The unavailability of phosphorus in rock phosphate to some southern crops. R. P. BARTHOLOMEW. Arkansas Agr. Expt. Sta. *J. Am. Soc. Agron.* **20,** 913–20(1928). Cotton, cowpeas, sorghum, seredella, beggarweed, *Lespedeza*, bur clover, rice and velvet beans made very little growth when P was supplied as rock phosphate. Vetch made about $^1/_3$ and sweet clover about $^3/_4$ as much growth from rock phosphate as with superphosphate. There was no definite relation between the Ca-P ratio in the plants and their ability to feed upon rock phosphate. Other factors than the Ca content of the plants seem to play an important part in detg. the ability of plants to use rock phosphate as a source of P. E. F. SNYDER

The fertilizing value of the phosphates of Niezqiska on the Dnjester in southeastern Poland. KAZIMIERZ STRZEMIÉNSKI. *Kosmos. J. Soc. Polon. naturalistes "Kopernik"* **51,** I-IV A, 14 pp.(1926); *Chem. Zentr.* **1927,** II, 1748.—The suitability of phosphate meal from Niezqiska was proved by its soly. in 2% citric acid and by vegetation expts. with oats in the presence of $(NH_4)_2SO_4$ C. C. DAVIS

Phosphoric acid in soils and in cane juices. E. D COLON. *Facts About Sugar* **23,** 87–8(1928).—Expts. upon the relation of available P_2O_5 (by 1% citric acid) in the soil to the P_2O_5 content of cane juices are compared with similar expts. in Hawaii (*C. A.* **18,** 877). It is suggested that 0.03% P_2O_5 in ripe cane juice be adopted as indicative of soil sufficiency in this ingredient and the tentative figure of 0.015% P_2O_5 in the soil The variance of the latter figure with the Hawaiian 0.004% is large, but 0.015% P_2O_5 is on the safe side while further efforts are made to collect evidence which might draw the 2 standards nearer. J. F. BREWSTER

Studies with sulfur for improving permeability of alkali soils. JOSEPH D. HAYES. Oregon Agr. College. *Soil Science* **25,** 443–6(1928).—Alternate wetting and drying increased the permeability of a dispersed black alkali soil. S treatment increased the rate of percolation from alkali soil and decreased the total alky. S-treated soil remained more open and permeable in extended percolation trials than non-treated soil. S treatments of soil subjected to leaching cause Ca to become reactive and to disperse Na or the ultra-clay complex. J. J. SKINNER

Oxidation of sulfur in limed and unlimed soils. O. M. SHEDD. Kentucky Agr Expt. Sta. *Soil Science* **26,** 93–105(1928).—This investigation consists of a study of the oxidation of S both in the presence and absence of $CaCO_3$ when added to 31 surface soils from the principal soil areas of Kentucky. Every soil oxidized appreciable quantities of the added S, with or without $CaCO_3$, in 30 days and still larger quantities after 120 days, which was the duration of the expt. The quantity of S added was 250 p. p. m. of the air-dried soil and the amt. of the added S which was oxidized after 30 days in the unlimed soil varied from 8.8 to 36%, whereas in the limed soil it varied from 6 to 37.2%. After 120 days, the amt. varied from 20.8 to 61.6% in the unlimed soils and from 17.2 to 64% in the limed samples. The differences between the above max. and min. ranges in the limed and unlimed samples for the same period of time are not significant. Very little consistent relation was found between the H-ion concns. of the treated soils, either

in their initial or final p_H values, and their acidity or alky. by titration or the amts. of added S oxidized by them. The amts. of acid found in the samples by the titrations were usually not in proportion to the quantities of S oxidized by them. The soils treated with $CaCO_3$ were nearly all rendered neutral or nearly neutral. The averages show that the soil that had been kept moist for 120 days had a slightly lower p_H value than the original, and the soils, either limed or unlimed, to which S was added also had slightly lower av. p_H values than the corresponding samples without S. J. J. S.

A study of the effect of commercial fertilizers on the performance of apple trees. J. R. COOPER. Ark. Agr. Expt. Sta., *Bull.* **227,** 1–61 (1928).—An 8-yr. study at Fayetteville on Ben Davis variety is reported. A fertilizer formula consisting of 8% P_2O_5, 4% N and 4% K_2O was adopted as standard and the orchard was divided into plots in order to test the 3 elements in combination, in pairs and alone. P produced more fruit spurs and definitely increased both the setting and yield of fruit. P also made a very decided increase in the growth of the orchard cover crops; N caused good gains in terminal and trunk tree growth, no. of fruit spurs, set and total crop of apples. $NaNO_3$ was slightly more effective than $(NH_4)_2SO_4$ during the first 2 yrs. of the expt., but after the second yr. no differences were noted. No gains over check in either growth or yield resulted from the use of K compds. N delayed ripening and reduced the red color of the fruit, largely because the increased density of the foliage reduced the amt. of light reaching the fruit. Neither P nor K appreciably affected fruit color or maturity. The quality of apples was not affected by any element or combination of fertilizers. Ranked according to net gains 8 - 40 - gave the best results, followed by N alone. There was a definite positive correlation between tree vigor and crop yield. Non-pruned trees produced more fruit than those receiving any kind of pruning. The no. of fruit spurs formed per tree gives a good indication of what the crop yield will be. C. R. F.

The effect of sodium chloride and carbonate on the growth of asparagus. BURT L. HARTWELL, JOHN B. SMITH AND S. C. DAMON. Rhode Island Agr. Expt. Sta., *Bull.* **213,** 16 pp. (1928) -In plots expts. with asparagus Na salts were applied for several years, the amts. each year increasing until 2000 lbs. per acre was reached. KCl tended to decrease active soil acidity and NaCl increased it. The alkaline carbonates decreased acidity. Where heavy rainfall prevailed over a period of 2 months active acidity and active alumina were reduced. When Na was omitted the yield of asparagus decreased. In K-deficient plots NaCl and Na_2CO_3 increased the yields. J. J. SKINNER

The influence of stimulants on the sprouting of potatoes. WILHELM VON VELSEN. Univ. Göttingen. *J. Landw.* **76,** 41–62 (1928).—Chem. and phys. methods of stimulating the sprouting of 3 varieties of potatoes were tested. Although the phys. methods were ineffective a no. of chem. agents hastened the sprouting. Marked effects were obtained by treatment with HCN, thiourea, ethylene dichloride and K thiocyanate, or injection of diastase. The total wt. and no. of sprouts were increased by these reagents. On following the development in spring and summer, however, no differences could be observed between treated and untreated tubers E. F. SNYDER

A survey of some emulsion problems confronting the sprayer. R. M. WOODMAN. Cambridge Univ. Hort. Research Station. *J. Pomology Hort. Sci.* **6,** 313–8 (1928); cf. *C. A.* **21,** 1325.—Two types of emulsions are possible when coal-tar or petroleum fractions are shaken with H_2O. They are oil-in-water and water-in-oil. The relative proportions of the ingredients and the manner of prepn. det. the kind of emulsion. Only the oil-in-water type of emulsion is of any value as a toxic spray. Methods for overcoming difficulties arising from the use of hard H_2O in making emulsions are given. Fourteen references are appended. A. L. MEHRING

Chemical testing of nicotine dusts. W. R. HARLAN AND R. M. HIXON. Iowa State College. *Iowa State Coll. J. Sci.* **2,** 313–6 (1928); cf. *C. A.* **18,** 1028, 1875; **19,** 1174; **21,** 2524; **22,** 2808.—When nicotine is absorbed by bentonite considerable heat is evolved. When the nicotined dust is extd. with ether for 12 hrs., a 3% dust retains 88% of the nicotine, a 6% dust 45% and a 14% dust retains 20% of the nicotine. In g. of nicotine per g. of bentonite these are 0.0264, 0.0276 and 0.0280, resp. Water removes very little nicotine from the original dusts and they have but little odor of nicotine. The addn. of $Ca(OH)_2$ increases the proportion of nicotine extractable by ether. The retained nicotine may be quantitatively recovered from the bentonite by steam distn. When nicotine vapors pass through a train which permits any contact with rubber, nicotine content and toxicity to rice weevil decrease. When the train is all glass, neither analysis nor the no. of weevils killed decrease in succeeding containers. Searches for reaction products of nicotine especially oxynicotine were fruitless. Conclusion: Losses of nicotine on adsorbents and in trains should be ascribed to *adsorption of nicotine* not to chem. change. F. E. BROWN

An investigation of spray coverages and arsenical residue in relation to the control of the codling moth. R. H. Smith. Univ. of Calif. Citrus Expt. Station, Riverside, Calif. *J. Econ. Entomol.* **21**, 571–88(1928).—See *C. A.* **21**, 978. C. H. R.

Progress report on the use of petroleum oil as an insecticidal spray. E. R. deOng. *J. Econ. Entomol.* **21**, 525–9(1928); cf. *C. A.* **22**, 3482.—The use of petroleum oils with high unsulfonated residues as insecticides on citrus trees and deciduous trees in foliage has recently shown a marked increase. The oil concn. for citrus trees is generally 2%, for deciduous trees 1–1.5%. Dormant spraying of deciduous trees with com. oil emulsions has also been widely practiced with little tree injury due to favorable weather and the more highly refined oil used (unsulfonated residue ranging as high as 70%). The use of petroleum oils on citrus trees is still accompanied by functional disturbances (non-coloring of fruit, premature fall of fruit, dearth of bloom, early decay of fruit in storage) due in part, at least, to oils of too low volatility. This may be partly overcome by the use of oils of great volatility. Besides the sulfonation test (cf. Gray and deOng, *C. A.* **20**, 963), the oxidation rate of oils promises to be valuable in detg. safety to the plant (cf. Sligh, *C. A.* **19**, 1491). The incorporation of nicotine and other active insect poisons directly into the oil before emulsifying it offers possibilities. Cf. deOng (*C. A.* **22**, 4197). C. H. Richardson

The use of oil sprays on citrus during 1926. R. S. Woglum. Calif. Fruit Growers Exchange, Los Angeles Calif. *J. Econ. Entomol.* 21, 530–1(1928); cf. *C. A.* **21**, 793.—Highly refined (white) petroleum oils of the lubricating type were quite extensively used in sprays for citrus insects in Calif. in 1926. The oils were generally high in unsulfonated residue but differed somewhat in viscosity and sp. gr. A marked difference in the rapidity with which the oil film disappears from the tree was noted among the various oils and was reflected in the effects upon scale insects and the trees. Such injuries as retarded coloration of fruit, crop reduction and impared quality were sometimes noted. Injury has been reduced by making fewer applications, avoiding cold-weather spraying, and by delaying the picking of fruit. A combination of oil spraying and HCN fumigation is the most successful way of controlling resistant scale. The control of the red spider by means of oil sprays varied with the type of oil used and the time of application of the spray. C. H. Richardson

A new method of using fish oil as an adhesive (in lead arsenate sprays for the gypsy moth). B. A. Porter and R. F. Sazama. *J. Econ. Entomol.* **21**, 633–4(1928).—Eight lbs. $PbHAsO_4$, and 14 lbs. water are worked into a paste, then 2 lbs. fish oil are added and the mixt. is pumped 2–3 times. It adheres very well on plant foliage. Similar mixts. may also be made with $BaSiF_6$, K_2SiF_6 and cryolite but are improved by the addn. of a casein and lime prepn. C. H. Richardson

A comparison between complete and incomplete digestion of sprayed apple foliage in determining arsenic by the Gutzeit method. J. M. Ginsburg. N. J. Agric. Expt. Station. *J. Econ. Entomol.* 21, 588–92(1928).—For complete digestion, the sprayed foliage was finely ground and digested with HNO_3 and H_2SO_4 until all org. matter had passed into soln. Incomplete digestion was accomplished by boiling the plant material with 10% HNO_3 or 20% HCl for 30 min., then filtering and washing. The amts. of As_2O_3 recovered were practically the same in both cases but the second method requires less time and is more convenient. C. H. Richardson

The germination and early growth of wheat treated with copper carbonate and tillantin R. K. Simpson and D. W. Davies. Univ. Coll., Wales. *Ann. Appl. Biol.* **15**, 408–22(1928).—The stimulating effects of $CuCO_3$ and of the proprietary substances, "uspulum" and "tillantin," upon wheat are in most cases due to the fungicidal properties of the prepns. These chemicals cannot be classed as plant stimulants. C. H. R.

English grown pyrethrum as an insecticide. I. J. C. F. Fryer, F. Tattersfield and C. T. Gimingham. Ministry of Agr. and Rothamsted Expt. Sta., Eng. *Ann. Appl. Biol.* **15**, 423–45(1928).—Pyrethrum flowers (*Chrysanthemum cinerariaefolium*) grown in six localities in England had equal toxicity to aphids (*Aphids rumicis*) and certain caterpillars and did not differ from samples grown in continental Europe. Extracts of equal weights of pyrethrum flowers tested at different stages of development differed very little. Artificial drying of the flowers did not affect their toxic properties. Wt. for wt., the flowers were about ten times as toxic as the stalks. Prolonged exposure of pyrethrum to dampness caused some loss in toxicity but if stored in a reasonable manner, its toxicity was retained for a long period. C. H. Richardson

Investigations in combating scab in North Bohemia. Frieder. Zimmermann. Sta. f. Pflanzenschutz, Tetschen, Liebwerd. *Z. Pflanzenkrankh. Pflanzenschutz* **38**, 208–15(1928).—"Nosprasen," a prepn. contg. Cu and As, was found effective against apple scab (*Fusicladium dendriticum*) when applied as a spray in 1.5% soln. after blossom-

ing and again one month later. This treatment had no effect on the caterpillar of *Laspeyresia pomonella*. LAWRENCE P. MILLER

Leaf scorch on fruit trees. T. WALLACE. Univ. of Bristol Hort. Res. Station. *J. Pomology Hort. Sci.* **6**, 243–81(1928).—Gooseberry bushes planted in sand were given a nutrient soln. lacking K_2O. The foliage of some of the bushes was sprayed with a 1% soln. of K_2SO_4 and that of the others with H_2O. The spray was prevented from reaching the roots. Treatment of the foliage with K_2SO_4 soln. effectively prevented leaf scorch, which was very bad on the other plants. Absence of the SO_4 radical had no effect. By continued water logging of the soil marginal leaf scorch can be produced in the presence of a complete nutrient in the soil soln. These expts. were repeated a second year with like results. With different varieties of apple trees in absence of K_2O leaf scorch appeared at different times but in each case the foliage had attained the same stage of maturity when it did appear. Analyses and descriptions of soils from a considerable number of leaf scorch centers are given. Either an excess or deficiency of soil H_2O seems to favor development of leaf scorch. In only 8 out of 46 areas was the available K_2O in the surface soil above 0.015%. In 5 cases from non-scorch areas the available K_2O was below 0.01%, but in every such case the mechanical analysis showed the soil texture and soil H_2O conditions to be much superior to that of scorch areas. Only 3 leaf-scorch soils contained below 0.01% available P_2O_5. Most of them were higher in P_2O_5 than ordinary soils. Both acid soils and these contg. as much as 31% $CaCO_3$ were obtained from scorch areas. Leaf scorch has often developed in orchards where nitrogenous and phosphatic fertilizers have been regularly applied but in none of these places have K_2O fertilizers been regularly used. A. L. MEHRING

The application of physiological methods to weed control. P. B. KENNEDY AND A. S. CRAFTS. Univ. of California. *Plant Physiology* **2**, 503–6(1927); cf. *C. A.* **13**, 1614; **14**, 86.—Field expts. on the spray control of morning glory (*Convolvulus arvensis*) with arsenicals of both acid and alk. reaction lead to the belief that the effectiveness is apparently dependent upon: (1) atm. and soil conditions which produce a water deficit resulting in a sub-atm. pressure within the xylem system, (2) a period of exposure to the spray of sufficient duration to provide for penetration of the toxic soln. Exposure may be extended by repeated spraying. Penetration is influenced by (1) insect injuries to the cuticle, (2) temp., (3) death of the cells, which renders the tissues readily permeable. There are 2 distinct functions to be performed by the spray soln.: (1) To make the tissues from the epidermis to xylem permeable. This is accomplished by acids, bases and hydrocarbons in the commercial sprays in use as weed killers. (2) To kill the tissue in the root after the soln. has been translocated into them. Arsenic is the most effective for this purpose. The problem remains to find agents more effective in fulfilling these requirements and to apply them under more ideal conditions than hitherto. WALTER THOMAS

Variations in the Mn content of certain vegetables (PETERSON, LINDOW) 11D. The selective absorption of inorganic elements by various crop plants (NEWTON) 11D. Tobacco frenching (VALLEAU, JOHNSON) 11D. Phosphate rock (JACOB) 18. The chemical composition of peat (WAKSMAN, STEVENS) 8. Economic symposium on N (HAYNES, *et al.*) 13. The utilization of waste sulfite liquor for fertilizer purposes (GÖRBING) 23. Red soils of Cochin China (AGAFONOV) 8. Chile saltpeter or synthetic $NaNO_3$ (EDDELBÜTTEL) 18. Correlation of kernel texture, test weight per bushel and protein content of hard red spring wheat (SHOLLENBERGER, KYLE) 12. Progress in cane sugar agriculture (AGEE) 28. I as a biogenous element. XVI. The presence of I in artificial fertilizers (SCHARRAR, SCHWAIBOLD) 11A. I problem and exophthalmic goiter prophylaxis from the point of view of agricultural chemistry (SCHARRER) 11G. Coagulations (WIEGNER) 2. Nitrogenous bases from hydrocarbon materials [for use in insecticides] (U. S. pat. 1,686,136) 22. Fertilizer from sulfite waste lye (U. S. pat. 1,684,712) 23.

ENGLISH, L. L.: **Some Properties of Oil Emulsions Influencing Insecticidal Efficiency.** Urbana, Ill.: Ill. Dept. of Registration and Education.

GAZA, WILHELM VON: **Die Kalkverarmung unserer leichten Böden.** Berlin: Kalkverlag. 23 pp. M. 0.65.

Fertilizer. EMIL BAUER and FIRMA EISLER AND SZOLD. Austrian 108,903, Oct. 15, 1927. Molasses residues at a concn. not exceeding 35° Bé. are mixed with chalk at a temp. not exceeding 60°. The mixt. is dried and ground.

Fertilizers. E. W. M. HAMMEL. Brit. 284,741, Sept. 27, 1926. Bone meal or other suitable material contg. or yielding albuminoids or peptones is treated with an

inorg. acid such as HCl (but not using H_2SO_4) and a K-bearing fertilizer material is added during the treatment. The product is concd., free acid is neutralized with NH_3, and the material is then dried in a vacuum and may be powdered and mixed with peat meal.

Fertilizers. CHEMICAL PRODUCTS COMPANY. Fr. 635,919, June 13, 1927. Natural phosphate is treated with $(NH_4)HSO_4$ to produce $(NH_4)_3PO_4$. The $CaSO_4$ formed is treated with $(NH_4)_2CO_3$ to form $CaCO_3$ and $(NH_4)_2SO_4$, the latter being converted in $(NH_4)HSO_4$ for re-use.

Ammonium phosphate. G. H. BUCHANAN (to American Cyanamid Co.). Brit. 284,322, Jan. 28, 1927. Solid mono-ammonium phosphate is treated with gaseous NH_3 to transform it wholly or partly into di-ammonium phosphate and obtain a *fertilizer* richer in N. An app. is described in which NH_3 may be supplied under pressure (suitably up to 60 lb. per sq. in.) and in which the material may subsequently be subjected to a vacuum to remove both free NH_3 and that combined as tri-ammonium phosphate.

Neutral phosphate. GEORGES TRUFFAUT. Fr. 635,523, June 3, 1927. Natural phosphate is treated with H_3PO_4 in the presence of SiO_2 or other substances forming stable compds. with F, so as to obtain a neutral phosphate, partially defluorinated, assimilable by plants because of the dissocn. of fluophosphates and fluorides. The amt. of H_3PO_4 used should be such as to give a mixt. of 80% bicalcium phosphate and 20% monocalcium phosphate.

Treating growing tobacco or other plants. WM. EGGERT, JR. U. S. 1,686,964, Oct. 9. In order to improve the quality of tobacco, the roots are supplied, at blossoming time, with a fermented soln. of tobacco leaves and petals, contg. a sweetening agent such as molasses, honey or sugar together with gum benzoin. A similar treatment may be applied to other plants such as cotton or cauliflower (which may be treated with sassafras and asparagus material, resp.).

Treating plants with insecticides, fungicides, etc. J. C. SAVAGE. Brit. 285,515, Aug. 10, 1926. The exhaust of an internal-combustion engine (which may be that of an airplane or land motor vehicle) is used to distribute toxic substances such as As_2O_3, Cu carbonate or Cu hydrate which may be suspended in a cloud-forming oleaginous vehicle such as cottonseed oil or mineral oil.

Insecticide. N. G. AND N. N. GRUZOV. Russ. 4555. Sept. 15, 1924. 1- or 2-Naphthylamine or both are dissolved in kerosene.

Fungicide. I. G. FARBENIND. A.-G. Fr. 635,436, June 2, 1927. Seeds are treated with a mixt. contg., *e. g.*, 15 parts anhyd. $CuSO_4$, 21 parts Rochelle salt, 9 parts NaOH and 5 parts NaCl. Cf. *C. A.* **22**, 2435.

Dry fungicide. EMIL MOLZ (to Chemische Fabrik Ludwig Meyer). U. S. 1,685,-715, Sept. 25. A mixt. of $HgCl_2$ 15, an alk. iodide such as KI 3.5 and talc 81.5% is adapted for formation of Hg iodide in moist soil.

Destroying cacti with organic arsenic compounds. HUGO STOLTZENBERG. U. S. 1,686,582, Oct. 9. Compds. such as diphenyl arsine oxide dissolved with H_2SO_4 are sprayed on or injected into catic.

16—THE FERMENTATION INDUSTRIES

C. N. FREY

History of alcohol and distillery. RENÉ PIQUE. *Chimie et industrie* Special No., 785–803(April, 1928). A. PAPINEAU-COUTURE

Studies of hydrogen-ion concentration and its significance in distilleries. W. DIEMAIR AND K. SICHERT. Inst. landwirtschaftliche Techn., Weihenstephan. *Biochem. Z.* **198**, 1–18(1928).—The changes in H-ion concn. and in titrational acidity were detd. in raw and steamed potatoes undergoing fermentation. S. MORGULIS

Fermentation by dried yeast preparations. II. ARTHUR HARDEN AND MARJORIE GIFFEN MACFARLENE. Lister Institute, London. *Biochem. J.* **22**, 786–9(1928); cf. *C. A.* **19**, 3283.—Various inorg. and org. salts (Na arsenate excepted) added to zymin placed in a large vol. of sugar soln. reduce the period of induction before the onset of rapid fermentation. BENJAMIN HARROW

The preparation of glycerol by the fermentation process. IRENA LIPSKA. *Roczniki Farmacji* **5**, 80–4; *Chem. Zentr.* **1927**, II, 947.—A biological investigation of the dependence of the yield of glycerol on the type, age and method of culture of the *yeast*. The yield varies with the concn. of Na_2SO_3 and *sugar*. J. S. REICHERT

Explosion risk in the industrial preparation of absolute alcohol from sulfite spirit. ERNST SCHLUMBERGER. Lichterfelde. *Papierfabr.* **25,** Tech.-Wiss. Teil 704(1927).—EtOH-air mixts. are to be avoided in the prepn. of abs. EtOH from sulfite spirit. The use of an inert gas is recommended. The explosive range of EtOH-air mixts. is about 4 times as great as with C_6H_6. J. L. PARSONS

The production of power alcohol from waste vegetable materials, such as grass, straw and husks. A. C. THAYSEN AND L. D. GALLOWAY. Royal Naval Cordite Factory, Dorset, Eng. *Ann. Appl. Biol.* **15,** 392–407(1928).—The hemicelluloses of various waste vegetable materials can be hydrolyzed by acids to yield exts. fermentable by alcohol-forming bacteria. The conditions under which *B. acetoethylicus* can be utilized to ferment the exts. obtained by hydrolsis of various plant materials have been studied. The conditions necessary for the tech. use of this fermentation have been ascertained. The prepn. and sterilization of the mashes may be carried out at temps. not exceeding 100°. The yield of alc.-acetone mixture in gals. per ton of raw material was as follows: *Hyparrhenia glauca* 18, corncobs 22.5, Esun grass 17, *Phormium tenax* 10, rice husks 14, rice straw 19, wheat straw 16, *Andropogon gayanus* 20, *Andropogon tectorum* 22, sorghum stems 17, papyrus (air dry) 16.5, sisal-hemp residue 4.8, sugar-beet residues 24.7. C. H. RICHARDSON

The industrial manufacture of absolute alcohol. JEAN BARBAUDY. *Ann. office nat. comb. liquides* **3,** 191–218(1928).—The miscibilities of C_6H_6, C_6H_{14} and C_7H_{16}, resp., with EtOH-H_2O mixts. are discussed in this review of 40 references. Distn. of aq. EtOH over CaO at 5 atms. pressure effects dehydration in about $^1/_5$ of the time required under atm pressure with only about 2% loss. The addn. of $C_3H_5(OH)_3$ to EtOH-H_2O mixts. produces a ternary system from which EtOH contg. approx. 0.7% by wt. of H_2O is obtained by distn. Anhyd. alc. can also be obtained by distg. aq. alc. under a pressure of 7 cm. of Hg. The distn. of EtOH-H_2O mixts. in the presence of C_6H_6 under 10 atms. pressure is the most efficient method for producing anhyd. EtOH. In practice petroleum distillate, d^{15}_{15} 0.72–0.73, may be used instead of the more expensive C_6H_6. R. E. SCHAAD

Sugar cane bagasse as a source of alcohol. WM. L. OWEN AND WM. P. DENSON. *Planter Sugar Mfr.* **80,** 61–4, 83–5, 102–5(1928).—Preliminary expts. with baled bagasse demonstrated (1) that the fermentable sugars in bagasse can be efficiently converted into alc. by fermentation. (2) That the rate of fermentation of solns. was accelerated by the addition of bagasse even where the alc. yields from the sugars present were not increased. More elaborate expts. on a lab. scale indicate that higher yields of alc. from fermenting molasses may be expected and that by addition of bagasse to worts of high density (33 Brix) a 25% greater alc. yield is obtainable in $^1/_3$ shorter time. In order to preserve the exhausted bagasse chips for the manuf. of *fiber board,* these may be subjected to acetic fermentation by substitution for beech shavings in vinegar generators. A line of procedure for the utilization of bagasse in the fermentation industry is suggested and its value in the distillery calcd. as well as the possibility of the absorption of Louisiana bagasse by local distilleries and the value of spent bagasse for the manuf. of fiber board. J. F. BREWSTER

The wood-alcohol problem. I. The saccharification of cellulose. P. LEONE AND A. NOERA. R. Scuola d'Ingegneria di Palermo. *Ann. chim. applicata* **18,** 205–39 (1928).—A crit. survey of the literature on the conversion of cellulose to sugar and thence to alc. (many references to which are given) leads to the conclusion that only by simplification of the technic and the more economical use of a cheap com. agent, such as HCl at greater diln. than recommended by Willstätter, can any process become a success industrially. This unsatisfactory state induced L. and N. to carry out expts. to det. (1) the proportion of glucose destroyed by HCl of different concns. in different times; (2) the proportion of glucose which under standardized conditions is condensed to polysaccharides (which are readily hydrolyzed by heat after diln.) by different concns. of acid and in different times; (3) the influence of the concn. of glucose on the saccharification of the cellulose; (4) the saccharifying action of HCl of different concns. on a systematic series of samples, so that the influence of the temp., time, concn. of acid and proportion of acid on the cellulose could be ascertained; (5) the saccharifying capacity of HCl of different concns. in the presence of various concns. of $ZnCl_2$ and (6) the max. obtainable concn. of glucose by the use of HCl of different concns. in the presence and in the absence of $ZnCl_2$. All expts. were on a lab. scale, with pure reagents and standard methods of analysis. The proportion of glucose destroyed increased rapidly with increase in the concn. of HCl, *e. g.,* 15% of the glucose in a 4% soln. being destroyed in 24 hrs. by 40% HCl and only 0.75% of the glucose by 35.6% HCl. Conversely the condensation products decreased with increase in the concn. of HCl. The

proportion of glucose destroyed diminished with increase in its concn. until it reached an almost const. value. For a given concn. of glucose, the condensation products diminished with increase in the concn. of HCl and increased with increase in the concn. of glucose. There was no appreciable destruction or condensation of glucose after 2 days of contact with HCl. Glucose retarded the saccharification of cellulose and in high enough concns. inhibited the reaction completely. The proportion of cellulose which was saccharified by HCl increased very rapidly with increase in concn. of the HCl. Thus under 1 set of conditions 16% HCl did not attack cellulose, 20% HCl saccharified only 5%, 37% HCl saccharified 31% and 40% HCl saccharified 93%. With a high concn. of HCl, an increase of temp. above 30° caused the destruction of the sugar formed, whereas with HCl in lower concn. a small increase of temp. favored a high yield of sugar. Since HCl not only forms sugar but also destroys the products of hydrolysis, the time of contact is an important factor, and it was found that in general the max. yield of glucose was obtained after 48 hrs. of contact, though with acid of only 35% or less a longer period of contact was necessary. The yield of glucose varied with changes in the cellulose-acid ratio, which conforms to the hypothesis of an equil. in the reaction. The yield diminished with increase in the concn. of cellulose. Several reasons are given to show that hydrolysis is not confined to dissolved cellulose, but that the HCl attacks both dissolved and undissolved cellulose, perhaps depolymerization first taking place, followed by saccharification. $ZnCl_2$ increased the ability of HCl to form glucose from cellulose. Though 16% HCl was inactive in contact with cellulose, considerable of the latter was hydrolyzed when $ZnCl_2$ was added, and with the aid of $ZnCl_2$ 35% HCl gave a higher yield of glucose than 40% HCl without $ZnCl_2$, most likely because the destructive action was diminished. With HCl above 35% and below 30% concn. there was a limit to the $ZnCl_2$ above which further addn. diminished the yield of glucose, probably because of destruction of the glucose, or of the formation of cellulose-$ZnCl_2$ complexes. Further expts. in this connection showed that $ZnCl_2$ did not aid the destruction of glucose by 37% HCl but greatly aided it by 40% HCl. Glucose retarded the saccharification of cellulose by HCl and $ZnCl_2$ and if in high enough concn. inhibited it completely. With the addn. of $ZnCl_2$, the time to reach the max. concn. of glucose under normal conditions was in all cases 2 days, and temps. of 10–30° gave the best yields. With increase in the cellulose-acid ratio, the yield of glucose diminished in the same way and to the same extent as in the absence of $ZnCl_2$. Expts. to det. the highest concn. of glucose with different concns. of HCl and of $ZnCl_2$ showed that with 36–37% HCl the highest concn. of glucose obtainable was 13.66%, with the use of about 7 times as much HCl as glucose obtained. With the addn. of $ZnCl_2$, the concn. of glucose was much higher and the consumption of HCl was less. The optimum concn. of $ZnCl_2$ was around 20% but it was of advantage even in lower concns. Concns. of 25–30% glucose can be readily obtained with a consumption of HCl about 4 times the sugar obtained. With 37% HCl and 20% $ZnCl_2$ the concn. of the glucose was 34%, with a consumption of acid only 3 times the glucose. Further expts. on the recovery of the HCl and $ZnCl_2$ are to be described. C. C. Davis

Butanol fermentation process. C. L. Gabriel. *Ind. Eng. Chem.* **20**, 1063–7 (1928).—The industrial development of the production of butanol and acetone began in an effort to produce synthetic rubber from isoprene, dimethylbutadiene and butadiene. In 1911 Fernbach isolated a culture "FB" which fermented potatoes. Weizmann later isolated a culture "BY" which possessed the proper fermentative qualities, and the war caused the British government to aid in the development of a process for producing acetone. The Commercial Solvents Corp. took over the Allied War Board plants at Terre Haute in 1919. Butanol, formerly a by-product, and its derivs. served as a substitute for fusel oil and amyl acetate. Thereafter acetone was a by-product. The original Terre Haute plant had 40 fermenters. In 1927 148 50,000-gal. fermenters were in operation at Peoria and Terre Haute. Over 30,000 bu. of corn are used per day and 600 tons of coal. Each fermentation gives off 150,000 cu. ft. of gas consisting of approx. $^1/_2$ H_2 and $^1/_2$ CO_2 by vol. A 12-ton synthetic-NH_3 plant was developed to utilize the H_2. Later a synthetic methanol using the scrubbed fermenter gas from which part of the CO_2 is removed, compressed to about 4500 lb. and run over catalysts, was developed from the NH_3 plant. Three vols. H_2 combine with 1 vol. $CO_2 \longrightarrow CH_3OH + H_2O$. A large Development Division is located at Terre Haute. C. N. Frey

Carbon tetrachloride as a denaturing agent. W. Meyer. *Chem.-Ztg.* **52**, 712 (1928); cf. *C. A.* **21**, 981.—According to the regulations of the German Government, alc. is often denatured with 1.5 vol. % CCl_4. This practice proved to be harmful for the manuf. of certain drugs that require the use of alc., especially in the case of ferrum sulfuricum, oleum hyoscyami, resina jalapae and unguentum glycerini. They all are

of inferior quality, if CCl_4-contg. alc. is used in the mfg. process. Also the equipment is affected by CCl_4. M. recommends the denaturation with 1 l. petroleum benzene (d. 0.650–0.720 and b. 40–110°) for each 100 l. of alc. G. SCHWOCH

The quality of foreign fortified wines. M. RÜDIGER AND W. DIEMAIR. Hochschule Weihenstephan. *Z. Untersuch. Lebensm.* **55**, 144–8(1928).—Analytical data on 23 samples of French, Greek, Spanish, etc., fortified wines. WILLIAM J. HUSA

The clarification of wines. M. RÜDIGER AND E. MAYR. *Z. angew. Chem.* **41**, 809–12(1928).—Clarification of wines by phys. and chem. means is still a problem requiring investigation. Various methods for clarification are discussed. C. N. F.

The deacidification of wines and fruit wines. EDUARD JACOBSON. *Getränke-Ind.* **1926**, 49–50; *Chem. Zentr.* **1927**, II, 2124.—A discussion of the *elimination of acids by* $CaCO_3$, which, however, on account of the neutral decompn. of acids is never carried out with young wines and must. The addn. of $CaCO_3$ should not exceed the corresponding quantity of tartaric acid in the wine because otherwise sol. Ca salts remain behind, the harmlessness of which is not definitely established. C. C. DAVIS

How can the observed mistakes in the grape and fruit wine technic be avoided, what influence have they on the quality of the liquors, and how must the sample be taken for proper judging? TH. RÖTTGEN. *Süddeut. Apoth.-Ztg.* **67**, 481–3; *Chem. Zentr.* **1927**, II, 1409.—The changes due to yeast mold, whose action can with certainty be suppressed with CO_2 and SO_2, consist originally of a slight and later of an appreciable lessening of the alc., acid and ext. content. The sample should be taken at 12°. At a higher temp. the alc. disturbs the Burkett action. J. S. REICHERT

Chemical analysis of a Greek wine. GIOVANNI ISSOGLIO. *Giorn. farm. chim.* **77**, 3–7(1928).—A high-grade de luxe wine of Calandri (Athens) of 1924 vintage had a topaz-brown color, agreeable aroma, sweet taste, sp. gr. 1.0782 and contained 14.57% alc. (by vol.), 22.08% sugars, 3.68% solids besides sugars, 0.33% ash, 0.532% total acidity as tartaric acid 0.152% volatile acids as AcOH and 0.92% glycerol. The c_H was 0.28 millimol., alky. of the ash 28.4. The proportions of the org. acids are given. MARY JACOBSEN

Determination of glycerol in wines and liqueur wines. L. FERRÉ AND J. BOURGES. Station Oenologique de Bourgogne. *Chimie et industrie* Special No., 775–7(April, 1928).—A study of Pozzi-Escot's method (*C. A.* **8**, 776), which consists essentially in defecating the wine, distg. the glycerol at 100° with steam and in vacuum, and detg. oxidimetrically with $K_2Cr_2O_7$ in the distillate. F. and B. found that it is necessary to remove practically all the solids (particularly the sugars) before distg., which is best done by defecating with $Ba(OH)_2$ (technic described). A specially devized *vacuum distn. app.* is described, made entirely of metal (except the distn. flask, which is of glass) to eliminate rubber connections and stoppers. Oxidation of the glycerol is carried out by boiling the distillate 2 hrs. under a reflux condenser with H_2SO_4 and a measured excess $K_2Cr_2O_7$, adding excess of standard Fe^{++} NH_4 sulfate, and titrating with $KMnO_4$. The method is relatively simple and can be applied to all wines, irrespective of their compn., and particularly of their sugar content. A. PAPINEAU-COUTURE

Determination of manganese in the wines of Peloro (Sicily). GRAZIA SOLARINO. *Boll. chim. farm.* **67**, 481–3(1928).—The soln. of the ash of 100 cc. wine in concd. HNO_3 was boiled with 0.5 g. PbO_2 and allowed to stand. As soon as the supernatant soln. acquired a red-violet tint it was titrated with 0.01 *N* $C_2H_2O_4$. The Mn content was 0.0012–0.0024 g./l. Tabulated results of 20 samples are given. MARY JACOBSEN

A new apparatus for determining the color of wort and of beer and for determining the p_H value of physiological liquids. A. JODLBAUER. *Allgem. Z. Bierbrauerei Malzfabr.* **55**, 211–3; *Chem. Zentr.* **1927**, II, 1627.—The app. which is described and illustrated is constructed according to the Walpole principle by F. Hellige & Co. (Freiburg, Breisgau). Expts. with the app. show that it gives very good results when applied to problems in the brewery lab. C. C. DAVIS

Norwegian aquavit. (MISS) J. MOROY. Lab. Centrale du Ministére de l'Agr. *Ann. fals.* **21**, 344–5(1928).—This product consists of a potato alc. aromatized with various herbs. Analysis of an authentic sample gave: alc. 42.0% by vol., total acidity 0.228 g. per l., non-volatile acidity 0.090 g. per l. (32.8 mg. % of abs. alc.), aldehydes 8.2 mg., esters 29.9 mg., higher alcs. 36.7 mg., total non-alc. volatile matter 107.6 mg. % of abs. alc. A. PAPINEAU-COUTURE

Rice beer (sake) in Japan. E. HUBER. *Allgem. Brauer- u. Hopfen-Ztg.* **67**, 1248–9; *Chem. Zentr.* **1927**, II, 2428; cf. *Allgem. Brauer-u. Hopfen-Ztg.* **67**, 1108, 1112–3, 1135–6, 1163–4, 1215–6, 1220–1.—*Midzuame* is a very old beverage which is still made only in a few remote parts of Japan. It is apparently a transition form from the old millet beer to the Chinese rice beer. The % compn. of midzuame is: water 13.02;

protein 0.26, maltose 53.03, dextrin 31.85, ash 0.15, fat and insol. 0.79. The % compn. of Japanese rice beer is: EtOH 3.04–4.60, ext. 5.06–5.85, maltose 0.77–1.73, protein 0.45–0.53, acids 0.077–0.161, ash 0.186–0.240, H_3PO_4 0.051–0.72. C. C. Davis

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Mode of operation of steam and fire cooking in liquid containers (Redenbacher, Huber) **13.** Transformation of methylbenzoylcarbinol to phenylacetylcarbinol with H_2SO_4 and under conditions of alcoholic fermentation (Kotchergine) **10.** The utilization of bagasse in the production of alcohol (Arnstein) **28.** Treating sewage and other waste products [from distilleries] (Brit. pat. 284,267) **14.** Purifying fruit juices, wort, etc. (Austrian pat. 109,011) **12.**

Moreau, L., and Vinet, E.: **Guide de la vinification rationnelle des raisins blancs.** Paris: Imprimeries des Sciences Agricoles. Reviewed in *Ann. fals.* **21,** 353 (1928).

Glycerol by fermentation. Émile A. Barbet. Fr. 32,678, June 1, 1926. Addn. to 611,880. Beet juices are concd. and then fermented with the addn. of H_2SO_3 to obtain glycerol. Cf. *C. A.* **22,** 135, 3950.

Recovery of nitrogen and acetone from distillery vinasses, molasses and the like. Nouvelles industries chimiques. Fr. 635,915, June 13, 1927 Vinasses and the like are distd. at a temp. below 600° with an excess of lime or other alk. earth base in a current of inert or reducing gas. The gas from the distn. itself after removal from it of ketones, NH_3 and amines, may be used as the inert gas. An alk. earth carbonate such as $CaCO_3$ or the residue from a preceding distn., or a hygroscopic substance such as sawdust may be added to the products to be distd.

Apparatus for the rectification of alcohol from wines under atmospheric pressure. Société des Établissements Barbet. Fr. 32,697, June 18, 1926. Addn. to 591,967.

Kiln for drying hops, etc. V. Elkington. Brit. 285,539, Nov. 11, 1926.

Arresting glucolysis of cells such as yeast or anaerobic bacteria. Schering-Kahlbaum A.-G. Brit. 284,643, Feb. 2, 1927. The living cells are subjected to the action of an org. F compd. such as fluoroacetic acid, fluorobenzoic acid or fluorobenzenesulfonic acid. Fluorobenzoic acid may be used in making beers for tropical countries

17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

Calabrian myrtle oil. Anon. *Riv. ital. essenze e profumi* **22,** No. 4, 10(1928).—*Myrtus communis* Lin grows spontaneously and abundantly in Calabria. The dried leaves are used in *tanning leather.* By steam distg. the leaves there is obtained a green-yellow essential oil, pleasant odor, d. 0/.9044–0/.911, α_{15} 21° 12′ – 22° 48′, n_{20} 1.465–1.467, acid value 1.8–2, ether value 72.8–85.87, ethers after acetylation 11.00–12.53, myrtenol 14.24–16.86, total alc. 34.00–40.16, soly. in alc. 80° 1:5–1:3.5, yield in essence 0.19–0.22%. R. Sansone

A color standard for tincture of cudbear, N. F. L. F. Cabel. *J. Am. Pharm. Assoc.* **17,** 148–9(1928).—Occasionally a sample of cudbear is encountered, the tinctorial power of which is below the av. Six lots of tincture were prepd. from as many specimens and a composite tincture was prepd. as a standard. The color was matched by a soln. contg. 0.9 cc. of 0.1 *N* $CoCl_2$, 3 cc. NH_4 carbonate test soln., 0.7 cc. 0.005 *N* $K_2Cr_2O_7$ and H_2O to make 10 cc. added in the order named. The matching of unknown tinctures is made in the usual way by dilg. The color of the dild. tincture fades so that the matching must be done with solns. on the day the dilns. are made.
L. E. W.

Calculation of alcohol in tinctures. F. Wratschko. *Pharm. Presse* **33,** 202–4, 216–9(1928).—In a recent address W. discusses the formula:

$$d_a = \frac{100d - x(a + 1.5x)/10^3}{(100 - x)/2},$$

in which d_a = density of alc. used in prepg. tincture, x = % of dry residue, d = d_{15}^{15} of the tincture, and a = an individual const. which in general equals 0.79. Exceptions are found in Tinct. Gallarum (a = 0.84), tinctures of the gums benzoin, myrrh, asafetida and amber (a = 0.65), and of certain seeds (a = 0.65 to 0.70). The data obtained by recent workers in this field (d., refractive index and dry residue) have been utilized in

the above formula in calcg. the indicated values of some 40 different tinctures, all the results being tabulated. W. O. E.

Russian & ethereal oils. A. CHERNUCHIN. *Oil & Fat Industry* (Russia) **1927**, No. 3–4 57–60; *Chem. Zentr.* **1927**, II, 2122.—A study of the oil from *Mentha piperita* showed that the best yield of oil and the highest menthol content are obtained from the partly bloomed plant. Fully bloomed plants give the poorest yield of oil with the lowest menthol content. To purify the oil, it is recommended that it be shaken with freshly pptd. $Al(OH)_3$. After standing 3–5 hrs. and filtering, an almost colorless oil is obtained. C. C. DAVIS

The determination of ethereal oils in drugs. J. STAMM. *Pharmacia* **1926**, No. 5, 5 pp.; *Chem. Zentr.* **1927**, II, 1519–20; cf. *C. A.* **22**, 3486.—The method is further developed by a supplementary detn. of the "*true content*" of ethereal oils in the drug. To det. this true content, there must be first detd. the quantity of ethereal oil which under the same conditions must be distd. with water in order to obtain the same yield as the yield of oil from the drug. This detn. was also made with the oleometer. The quantity of oil must not exceed the capacity of the oleometer. 0.15, 0.14, 0.13 .... 0.1-cc. portions of oil were distd. with 250 cc. of water and a table of yields was compiled. The no. corresponding to the yield of oil from the drug was detd. from the table and from this the quantity of oil used in the distn. The "true content" of ethereal oil in the drug must correspond to this quantity. Satisfactory results were obtained with *Fructus anisi, Folia rosmarini, Herba thymi, Folia menthae piperitae* and *Fructus carvi.* C. C. D.

Determination of the "true content" of ethereal oil in drugs by the method of Stamm, using a butyrometer. ERNST JAGERHORN. *Pharmacia* **1926**, No. 5, 7 pp.; *Chem. Zentr.* **1927**, II, 1520.—Instead of using the oleometer of Stamm (cf. preceding abstr.) the original butyrometer of Gerber was utilized. Here too the loss of CCl_4 was 1 graduation mark and was added at the end. The most ethereal oil was obtained from the drug in powder form, the least from the whole drug. Small quantities, *e. g.*, 5 g , yielded relatively more oil than large or very small quantities, *e. g.*, 2 g. *Fructus foeniculi, Herba majoranae* and *caryophylli* gave greater yields of ethereal oils and *Fructus anisi* and *carvi* gave smaller yields than the yields which are recorded in the literature. The true oil content of *Cortex cinnamomi chin.* could not be detd. because under the conditions the cinnamon oil could not be distd. without leaving a residue. C. C. D.

Method for the determination of ethereal oils in drugs, according to Stamm. EINO TIKKANEN. *Pharmacia* **1926**, No. 5, 3 pp.; *Chem. Zentr.* **1927**, II, 1520; cf. preceding abstr.—The yields of oil from various drugs were detd. by the oleometer method of Stamm (without regard to the true oil content) to ascertain the precision of the method. All detns. of the same powdered drug agreed precisely with one another and gave excellent values. The data are recorded in tables. The procedure can be carried out in 1.25 hrs. and costs very little. C. C. DAVIS

The composition of strychnine phosphomolybdate. C. ANTONIANI. R. Istituto Superior Agrario, Milano. *Giorn. chim. ind. applicata* **10**, 408–10(1928).—In completion of expts. on the detn. of P_2O_5 by the use of strychnine molybdate (cf. *Giorn. chim. ind. applicata* **10**, 203 (1928)), the compn. of the ppt. was detd. The best conditions for its sepn. are with 350 parts of MoO_3, 2500 parts of HNO_3 and 10 parts of strychnine nitrate per 1 part of P_2O_5. It is advisable to wash the ppt. with 10% HNO_3. Under these conditions the *compn. of the strychnine phosphomolybdate* was $11MoO_3.H_3PO_4.(C_{21}H_{22}N_2O_2)_3.2HNO_3$. C. C. DAVIS

Fluorescence and some experiments with the analytical quartz lamp. ARNO MÜLLER. *Riechstoffind.* **1927**, 139–41; *Chem. Zentr.* **1927**, II, 2123.—Expts. with the Hanau analytical quartz lamp show that it is of no value in judging the purity of ethereal oils and synthetic perfumes, since the fluorescent colors of these substances are often identical in spite of their varied nature, and since their mixts. differ little from the individual substances. The results of numerous expts. are compiled in tables. C. C. DAVIS

Measurement of odor and its practical application. A. ROSENTHAL. *Riechstoffind.* **1927**, 142–43, 150–1, 161–2; *Chem. Zentr.* **1927**, II, 2123; cf. *C. A.* **22**, 138.—A method was developed for detg. whether one perfume has a more powerful odor than another and if so how much more powerful it is. An 0.88% soln. of the perfume in diethyl phthalate was dild. progressively with more diethyl phthalate until the odor was no longer distinguishable. The results of the comparative expts. are compiled in tables. C. C. DAVIS

The fixation problem. K. T. KELLER. *Riechstoffind.* **1927**, 144, 152–3; *Chem. Zentr.* **1927**, II, 2123.—A discussion of natural and artificial fixing agents, with reference to their action and their applicability in the *perfumery industry,* special attention being given to the resins of Schimmel & Co. C. C. DAVIS

Resins and resin products in perfumery. A. M. BURGER AND I. CLEMENTE. *Riechstoffind.* **1927,** 149–50, 162–3, 175–6; *Chem. Zentr.* **1927,** II, 2360.—Natural resins, balsams and oleoresinoids obtained from these products are described in detail, with special reference to their use in the *perfumery industry* and in the *manuf. of toilet soaps.* C. C. DAVIS

Investigation of thuja oils from the Caucasus. B. RUTOVSKII AND K. GUSSEVA. Chem.-Pharm. Research Inst., Moscow. *Reichstoffind.* **1927,** 185; *Chem. Zentr.* **1927,** II, 2723; cf. Rutovskii, Winogradowa and Koslov; *Chem. Zentr.* **1926,** I, 1306.—Fractionation of an oil of *Thuja occidentalis* yielded α-pinene, α-thujone (which readily isomerizes to β-thujone), fenchone and several esters. Oil from the leaves of *Th. varreana* had d_{20} 0.9078, α_D —1.23, n_D^{20} 1.4550, acid no. 1.5, ester no. 16.36, ester no. after acetylation 30.36, and yielded sabines, α-thujone and thujyl alc. From the twigs of *Th. gigantea var. sempcraurea* was obtained a 3.07% yield of oil, with d_{20} 0.9145, α_D —1.21°, n^{20} 1.4552, acid no. 2.34, ester no. 26, ester no. after acetylation 47.15, and contains α-thujone, α-pinene and thujyl alc. C. C. DAVIS

Methods of testing spermaceti according to the directions of some pharmacopeias. BOLESLAW OLSZEWSKI. Univ. Warsaw. *Roczniki Farmacji* **4,** 131–5; *Chem. Zentr.* **1927,** II, 1599.—Only tests of the acid no., sapon. no. and I no. are reliable, detns. of the alc. content and of the d. being of no value. C. C. DAVIS

Determination of the total geraniol in Java oil of citronella. SCHIMMEL & CO. *Schimmel & Co. Ann. Rept.* **1927,** 21; *Chem. Zentr.* **1927,** II, 1519.—To avoid discordant results, very precise and uniformly executed work is necessary. The use of Ac_2O more concd. than 85% and of completely dehydrated Na_2CO_3, acetylation for 2 hrs. and sapon. for 2 hrs. are indispensable. C. C. DAVIS

Adulteration of ethereal oils and natural perfumes. SCHIMMEL & CO. *Schimmel & Co. Ann. Rept.* 1927, 43–4, 48, 56, 64, 90, 93–4, 137–8, 144; *Chem. Zentr.* **1927,** II, 1519.—A continuation of publications and reports on cases of adulteration. *Birch bud oil.*—This was adulterated with Me salicylate, cedar oil and Et phthalate. *Bitter almond oil.*—A crude grade of BzH contg. Cl was sold for this oil. *Lemon oil.*—In 1 case this was adulterated with 6% of EtOH and 50% of lemon oil terpenes, in another case with 20% of mineral oil. *Eucalyptus oil.*—A "guaranteed 100% pure" grade was chiefly terpineol. *Cherry laurel oil.*—This consisted for the greater part of artificial BzH contg. Cl, but no HCN. *Lavender oil.*—This consisted of spike oil contg. Et phthalate. *Rose oil.*—Artificial esters were found. *Sandalwood oil.*—East Indian oil in some cases contained Et phthalate and Et benzoate, while 1 sample was composed almost wholly of cedar oil and another sample contained a mineral oil volatile with steam. *Juniper berry oil.*—This was apparently adulterated with nutmeg oil. *Geraniol.*—Grades marked "superfine," "100%," and "1A fine" left much to be desired in quality. *Liquid thymol.*—This was composed entirely of thyme oil or partly of carvacrol. C. C. DAVIS

Oil from Geranium macrorrhizum. SCHIMMEL & CO. *Schimmel & Co. Ann. Rept.* **1927,** 114, 115; *Chem. Zentr.* **1927,** II, 1519.—The odor of the oil obtained from a plant which grows wild and is also cultivated (chiefly in Bulgaria) resembles iris oil or muscatel sage oil. It has a soft, cryst., paraffin-like consistency, m. 25–35°, d_{15} 0.9431–0.9638, α_D —5°45′ to —7°38′, n_D^{20} 1.50642–1.51538, acid no. 1.2–1.5, ester no. 5.6–14.9, ester no. after acetylation 33.6–35.5, sol. in 6–7 vols. of 80% EtOH (slight turbidity) miscible in all proportions with 90% EtOH, contains 50% of a compd. of the nature of an oxide, which m. 54–5°. After sepn. of the solid components, the oil had d_{15} 0.9460, α_D —8°10′, n_D^{20} 1.50698, ester no. after acetylation 54.1, and was sol. in 0.5 vol. of 90% EtOH, while with more than 1.5 vols. there was a sepn. of paraffin. C. C. DAVIS

Castoreum. SCHIMMEL & CO. *Schimmel & Co. Ann. Rept.* **1927,** 135; *Chem. Zentr.* **1927,** II, 1519.—Steam-distn. of 4.810 kg. of castoreum from Canada yielded 2.1% of oil, about 0.5 of which was composed of phenols. The phenolic part contained *o-cresol* and a *phenol* $C_{15}H_{14}O_2$, while the part from which the phenols had been sepd. contained acetophenone, benzyl alc. and *l*-borneol. C. C. DAVIS

Synthetic menthol. SCHIMMEL & CO. *Schimmel & Co. Ann. Rept.* **1927,** 139; *Chem. Zentr.* **1927,** II, 1519.—A menthol was synthesized which m. 35° and in appearance and odor could not be distinguished from menthol obtained from peppermint oil. The phys. properties of the synthetic product were intermediate between those of artificial racemic menthol from thymol or piperitone and natural *l*-menthol. C. C. DAVIS

Synthesis of amino alcohols from isosafrole, isoeugenol and anethole. C. MANNICH AND FRIDA SCHMITT. *Arch. Pharm.* **266,** 73–84(1928).—Since the benzoate of

1-(3,4-methylenedioxyphenyl)-1-dimethylaminopropane-2-ol (I) (Mannich, *C. A.* **4**, 1044) has been shown to possess powerful, but weakly toxic, anesthetic properties, compds. were prepd., by the action of Me_2NH, Et_2NH and $C_5H_{10}NH$, resp., on the dibromides of isosafrole, isoeugenol methyl ether and anethole, in the hope of developing pharmacologically superior products. While the results hoped for were not realized, 9 new alc. bases were obtained, which were volatile in vacuum mostly as thick sirups, crystg. in part only after long standing. The alc. base arising from the interaction of $C_5H_{10}NH$ on isoeugenol methyl ether decompd. on distn. Since these alc. bases possess 2 asym. C atoms, 2 stereoisomeric *dl*-forms are possible in each case. Their acylation with BzCl and p-$O_2NC_6H_4COCl$ progresses for the most part smoothly; in certain cases, however, secondary reactions tend to lower the yield. With (I) a better yield than heretofore (about 70%) was realized, this compd. m. 66–8° and b_{16} 178–82°. On heating the *methiodide* (m. 176°) with KOH, it decompd. into Me_3N and isosafrole oxide, a behavior likewise noted in other reactions, like acylation. Thus, in prepg. the *benzoate* (m. 80–3°, *HCl salt* m. 202–8°), a *by-product* m. 164–5° was isolated in the form probably of the benzoate of *1-(methylenedioxyphenyl)-1-chloropropane-2-ol*, $C_{17}H_{15}O_4Cl$. The *p-nitrobenzoate* of (I) (*HCl salt*, $C_{19}H_{20}N_2O_6$.HCl, m. 223°) and p-aminobenzoate, $C_{19}H_{22}O_4N_2$, m. 120° are both anesthetics. *1-Diethylamino-1-(3,4-methylenedioxyphenyl)propan-2-ol*, b_{14} about 175° (*HCl salt*, $C_{14}H_{21}O_3N$ HCl, m. 196°); *benzoate* (*HCl salt*, $C_{21}H_{25}O_4N$.HCl, m. about 185°, powerful anesthetic) (*HCl salt*, $C_{14}H_{21}O_3N$.HCl, m. 196°); *benzoate* (*HCl salt*, $C_{21}H_{25}O_4N$.HCl, m. 185°, powerful anesthetic); p-nitrobenzoate (*HCl salt*, $C_{21}H_{24}O_6N_2$.HCl, m. 220°). Oxidation of the amino alc. with CrO_3 in AcOH lead to the formation of 3,4-methylenedioxybenzyl methyl ketone, m. 87–8°. *1-Piperidyl-1-(3,4-methylenedioxyphenyl)propan-2-ol*, $C_{15}H_{21}O_3N$, b_{16} 235–40°, m. 77°; *benzoate* (*HCl salt*, $C_{22}H_{25}O_4N$.HCl, m. 204° (decompn.) strongly anesthetic). 1-Dimethylamino-1-(3,4-dimethoxyphenyl)propan-2-ol, m. 51° (Mannich, *l. c.*); *p-nitrobenzoate* (*HCl salt*, $C_{20}H_{24}O_6N_2$.HCl, m. 198°). *1-Diethylamino-1-(3,4-dimethoxyphenyl)-propan-2-ol*, $C_{15}H_{25}O_3N$, b_{14} 197–9°. *1-Piperidyl-1(3,4-dimethoxyphenyl)propan-2-ol*, crude base, b_{14} 212–20°, decompg. into $C_5H_{10}NH$ and 3,4-dimethoxybenzyl methyl ketone. 1-Dimethylamino-1-p-anisylpropan-2-ol, b_{17} 162°, m. 39° (*HCl salt*, $C_{12}H_{19}O_2N$.-HCl, m. 195°); *p-nitrobenzoate* (*HCl salt*, $C_{19}H_{22}O_5N_2$.HCl, m. 205° (decompn.)); *p-aminobenzoate*, $C_{19}H_{24}O_3N_2$, m. 159°, in dil. HCl strongly anesthetic. *1-Diethylamino-1-p-anisylpropan-2-ol* (*HCl salt*, $C_{14}H_{24}O_2NCl$, very hygroscopic), b_{20} 210°. *1-Piperidyl-1-p-anisylpropan-2-ol*, $C_{15}H_{23}O_2N$, b_{14} 203–5° (*HCl salt* m. 180°); *p-nitrobenzoate* (*HCl salt*, $C_{22}H_{27}O_5N_2Cl$, m. 213° (decompn.)). While the above-described amino alcs. should represent mixts. of stereoisomerides, there is considerable doubt whether this is the case since the cryst. representatives do not appear to be mixts. W. O. E.

Physical constants of bromoform. H. Buhmann. Univ. Göttingen. *Arch. Pharm.* **266**, 123–5(1928).—Of two samples of pure $CHBr_3$ examd. one had d_4^{15} 2.9000, b_{760} 146.3°, solidifying at 7.5°, the other b_{760} 147.2°. The latter mixed with 1% of abs. EtOH had $d_{15.5}^{15.5}$ 2.8161, b_{760} 146.6°, solidifying at 5.4°. While this sample fulfils the Ger. Pharm. requirements, the official method for its evaluation is unsatisfactory. The use of a Schantz app. is advisable in detg. the proportions volatile between the prescribed limits. W. O. E.

Note on the preparation of magnetic oxide of iron. Wilfred H. Linnell. *J. Pharm. Soc.* **1**, 178–81(1928).—Fe_3O_4 has not been obtained, but hydrates contg. as much as 17% of potential ferrous Fe have been prepd. A method is given showing the optimum concns. of reactants and precipitants previous to pptn. The ppt. should be boiled until it becomes black (10 min.). Prolongation of boiling causes oxidation. Temp. of drying should not exceed 75°, but after the product is dried it appears to be stable even at red heat. Better results were obtained by using NaOH as precipitant than with NH_4OH. The work is being continued in order to det. the conditions necessary to produce hydrated ferroso-ferric oxides of definite chem. constitution. W. O. E.

Constitution of tartar emetic and scale preparations. I. Wilfred H. Linnell and Catherine Tickle. *J. Pharm. Soc.* **1**, 194–9(1928).—While the present communication is mainly historical, certain preliminary expts. are reported or under way. Thus, the behavior of tartar emetic itself with various methylating agents is being examd. to see if a deriv. contg. Sb can be formed. Expts. are also being made, using $Fe(OH)_3$ in place of Sb_2O_3, to det. whether the formation of a scale prepn. can be regarded as a parallel to the formation of an emetic. Touching the interaction of diethyl tartrate and freshly pptd. $Fe_2(OH)_6$ and Sb_2O_3, resp., it appears that reaction occurs, but in the latter case at any rate is confined to hydrolysis of the ester, no combination between the ester and oxide occurring. Results from expts. in dialysis of scale prepns. lead to the conclusion

that $Fe(OH)_3$ is simply held in soln. in the scale prepn. and that no combination obtains between the hydroxy acid and the Fe. W. O. E.

Notes on the evaluation of syrupus simplex with Fehling solution. FRITZ WISCHO AND LUDWIG ZECHNER. Univ. Graz. *Pharm. Monatsh.* **9**, 191–3(1928).—Very important in applying the Pharm. Fehling test is a consideration of the fact that practically every simple sirup contains a certain amt. of invert sugar, which falls below the Pharm. limit of sensitiveness. W. O. E.

Comparative examination of different commercial grades of cardamom. W. OTTE AND H. WEISS. Hygien. Inst. Hamburg. *Pharm. Zentralhalle* **69**, 613–6(1928).—The entire fruit, the seed capsules and the ground entire fruit have been made the subject of study. The results obtained are tabulated. W. O. E.

Reactions of novocaine and its differentiation from cocaine, alypine, holocaine and stovaine. LAD. EKKERT. Univ. Budapest. *Pharm. Zentralhalle* **69**, 616–7(1928).—Novocaine yields in alk. soln. with I iodoform; furthermore, with $ZnCl_2$ as also with *p*-dimethylaminobenzaldehyde and H_2SO_4 it gives a yellow to a dichromate-red color; likewise with furfural-H_2SO_4, furfural-H_3PO_4 and with furfural alone violet-red to purple-red color tones develop. Comparative tests with cocaine, β-eucaine, alypine, holocaine and stovaine indicate that the above behavior of novocaine is characteristic, and may be used as a means of identification. W. O. E.

Preparation of phenylcinchoninic acid. F. CHEMNITIUS. *Pharm. Zentralhalle* **69**, 549–51(1928).—One of the procedures for prepg. this compd. involves condensation of $AcCO_2H$ with PhCH:NPh. Detailed methods are outlined for the prepn. of these 2 substances, and their subsequent condensation to phenylcinchoninic acid. W. O. E.

Cocaine. P. MARTELL. *Pharm. Zentralhalle* **69**, 551–6(1928).—A description of the culture of *Erythroxylon coca* Lam. as carried on notably in S. American countries, in connection with the use of the leaves by Indians and whites, and the results of such use and the consumption of cocaine on the animal economy. W. O. E.

Pharmaceutical science in its relationship to the pharmaceutical-chemical industry. HERMANN THOMS. Berlin. *Apoth. Ztg.* **43**, 995–6(1928).—Discursive. W. O. E.

Microchemistry of alkaloids. HANS BECKMANN. *Pharm. Ztg.* **73**, 1165–6(1928).—Simple manipulations and app. are described for the identification (through sublimation, crystn. and color tests) of some 18 alkaloids and materials contg. them. Critical mention is made of the official Ger. methods. W. O. E.

Preparation of sodium salicylate tablets. I. G. OBERHARD. *Pharm. Ztg.* **73**, 1212(1928).—The article is a reply to a request for a suitable formula for compounding these tablets, notably with reference to the desirable vehicular matter contained therein. W. O. E.

Pharmacological evaluation of digitalis specialties. G. JOACHIMOGLU. Univ. Berlin. *Pharm. Ztg.* **73**, 1212–3(1928).—The examn. of 6 different com. samples of digitalis prepns. clearly indicates the necessity for the official control of such medicaments. W. O. E.

Characterization of homeopathic preparations. H. NEUGEBAUER. *Apoth. Ztg.* **43**, 1209–11(1928).—The microchem. evaluation of varying potencies of $K_2Cr_2O_7$, As_2S_3, tartar emetic, metallic Bi and Bi subnitrate is discussed. W. O. E.

Estimation of the condurangin content of condurango bark. HUGO WAGNER. Univ. Graz. *Pharm. Monatsh.* **9**, 189–91(1928).—The present study is an amplification of the recent work by Zechner, Wischo and Wagner (cf. *C. A.* **22**, 2637) on the subject. The procedure followed is described in detail, and the results obtained are tabulated. W. O. E.

Microchemistry of Illicium verum Hook. and Illicium religiosum Sieb. EDITHA SIERSCH. Univ. Wien. *Pharm. Zentralhalle* **69**, 581–5, 601–5(1928).—The carpels of both species of *Illicium* contained sikimmic acid, in much greater quantity in *I. religiosum* than in *I. verum*, thus confirming the findings of Eykman. The seeds of neither plant contain this acid. By means of various solvents a cryst. substance was extd. from *Illic. relig.*, the chem. compn. of which could not on account of the minute quantity be detd. The prepn. of sikimmin *via* Eykman was repeated with the result that minute quantities of a crystn. substance were isolated which had similarity to the sikimmin of Eykman (from *Illic. relig.*). For the differentiation of toxic from non-toxic fruits, Rosoll's saponin test was made on the fruit of *Illic. verum*, with the result that this test, while in many cases of value, cannot be considered absolutely reliable. A microchem. study of the Combes saponin test as applied to both *I. verum* and *I. religiosum* leads to the conclusion that both plants contain a saponin. Attention is directed to various contradictions in the literature relative to *Illic. relig.* Siebold and *Skimmia japon.* Thung. and their recognition. W. O. E.

New liver-fluke remedies. NEUMAN WENDER. *Pharm. Ztg.* **73,** 968–9(1928).—In treating the serious disease of the liver in cattle, sheep and goats, caused by the liver fluke *Fasciola hepatica* (termed *Distomum hepaticum* by W.), recourse was formerly had to male fern ext. and *Kamala;* more recently to prepns. of CCl_4, hexachloroethane, either alone or with male fern ext. W. O. E.

Amomis caryophyllata, Kr. et Urb., and the production of bay rum. KAREL DOMIN. *Časopis Československého Lékárnictva* **7,** 210–21(1927).—A comprehensive review. WILLIAM J. HUSA

Some notes on pharmaceutical analysis. O. TOMÍČEK AND ADOLF JÁNSKÝ. Charles Univ., Prague. *Časopis Československého Lékárnictva* **7,** 313–9(1927).—A discussion of the application of electrometric titration in pharmacy, with examples of the use of this method in analysis of "Sedobrol" (a prepn. contg. Na halides and other substances), and in the indirect detn. of some alkaloids in triturates. WILLIAM J. HUSA

Emulsions and their preparation. E. ISELIN. *Boll. chim. farm.* **67,** 225–8 (1928).—For the prepn. of 100 g. of stable oil-in-water emulsions the following min. amts. of 0.1 *N* NaOH are required per 20 g. oil: olive oil 10–15 cc., cod-liver oil 5 cc., castor oil 10 cc. The emulsions are not perfectly stable; the max. emulsification is established only after a few days. Cod-liver oil gives the best emulsions because of its content in free fatty acids. The Na ions tend to ppt. the droplets. The castor-oil emulsion is less good and owes its stability only to its greater viscosity. The addn. to the oil of 10–2.5% oleic acid increases the stability of the emulsions; however, they cannot be given internally because of the hemolytic effect of oleic acid. Stable water-in-oil emulsions are obtained with the following min. amts : For olive oil 22.4 cc. lime water, or 10 cc 0.1 *N* $Ca(OH)_2$ ($Ba(OH)_2$), for cod-liver oil 33.6 and 15 cc., for castor oil 22.4 and 10 cc. These emulsions are of salve consistency and sep. neatly from the aq. layer, showing that there is no oil emulsified in the water. They are easily coagulated by excess alkali. Emulsification is favored by gelatin or, better, gum arabic. To 25 g. *castor oil* heated on the water bath add a mixt. of 15 cc. lime water and 10 g. acacia mucilage, stir, cool and triturate in a mortar with 1.5 g. gum arabic. To 1.5 g. melted palmitic acid add 8 g. *N* KOH and dropwise with stirring 20 g. acacia mucilage, a soln. of 0.5 g. gelatin in 40 cc. water and a hot mixt. of *cod-liver oil* with 30 g. sirup. Palmitic acid was chosen because of its beneficial physiol. action. I. discusses Adam and Matthews' and Hildebrand's views on emulsification. Hildebrand's theory is borne out by expt. Cs, K, Na and Ag form oil-in-water emulsions, the degree of emulsification decreasing with the atomic vol. in the above order. Ca, Mg, Zn, Al and Fe form water-in-oil emulsions, the stability of which increases inversely with the atomic vol. M. J.

Lavender. VITTORIO NIGRISOLI. *Boll. chim. farm.* **67,** 298–302(1928).—Compn., properties, uses and production of lavender oil are discussed. MARY JACOBSEN

Physical constants and assay of some camphor preparations. A. JERMSTAD. *Boll. chim. farm.* **67,** 302–3(1928); cf. *C. A.* **22,** 1824.—The best method of detn. of camphor in spirits of camphor is by isolating and weighing. To 10 cc. of the alc. soln. in a 200-cc. separatory funnel add a mixt. of 4 parts satd. NaCl and 1 part water, shake vigorously 5 min. and allow to stand 15 min. Shake the aq. layer out with 20 cc. ether, and shake the combined ether solns. vigorously with 15 cc. of the NaCl soln. Transfer the ether layer to a 100-cc. Erlenmeyer flask contg. 5 g. Na_2SO_4, rinse the funnel with ether to make up the soln. to 40 cc., and allow to stand overnight. Weigh 20 g. of the soln. into a 50-cc. flask, evap. about 80% of the ether on a gently heated water bath, then dry in a vacuum desiccator to const. wt. The residue ought to consist of pure camphor. A table gives the d., n and α of camphor oil and spirits of camphor. MARY JACOBSEN

The color reactions of lecithin. D. MIGLIACCI. *Boll. chim. farm.* **67,** 324–5 (1928); cf. Ekkert, *C. A.* **22,** 1651.—Tabulated color reactions of lecithin with furfural, sucrose, BzH, salicyl and anisyl aldehydes, vanillin and piperonal at the zone of contact with concd. H_2SO_4 and after shaking. MARY JACOBSEN

Saffron substitutes in Sidenham's laudanum. ANGELO ANGELETTI. *Giorn. farm. chim.* **76,** 37–40(1927).—The common adulterants and substitutes of saffron are marigold, safflower, curcuma, sandalwood or coal tar dyes. Two cc. of laudanum is treated with 20 cc. water and shaken out with 10 cc. AmOH. The evapn. residue, contg. the dye and traces of narcotine, papaverine and meconic acid, is treated successively with concd. H_2SO_4, HNO_3, HCl and NH_3. A table gives the color reactions of saffron and adulterants. Coal-tar dyes, red sandalwood and curcuma are also extractable with ether. MARY JACOBSEN

Chemical assay of ergot. ALBINA DIAMONTE. *Giorn. farm. chim.* **76,** 127–30 (1927); cf. Goris and Liot, *C. A.* **18,** 3220.—Ergot powder contg. 0.304% alkaloids was

extd. with water-$CHCl_3$ with and without tartaric acid directly (I) and after autoclaving in alc. (II). The assay was made by Goris and Liot's silicotungstate method. The acidulated I contained 0.071% alkaloids, the $C_4H_6O_6$-free I 0.065%. The content of II was slightly lower. Stabilization of ergot is useless at least in the case of dried ergot, which has probably already undergone enzymic decompn. The present method of extn. is very unsatisfactory. MARY JACOBSEN

Sterilization of catgut. E. BARONI. *Giorn. farm. chim.* **77,** 130–42(1928).—Description of Claudius' I sterilization followed by autoclaving in alc. at 0.5 atm. MARY JACOBSEN

Chemical and biological assay of digitalis ambigua. ISIDE SCAGLIOLA. *Giorn. farm. chim.* **76,** 197–201(1927); cf. Burmann, *C. A.* **6,** 1494; *J. pharm. chim.* **1915,** 33.—The digitalin content (Keller-Ecalle) was 0.078%. The m. l. d. (1-hr. frog method) was 133% of that of *Digitalis purpurea.* MARY JACOBSEN

The sensitiveness of Otto's reaction for strychnine. LEONARDO BELTRAN AND ALBERTO IBARRA. *Quim. ind.* **5,** 137(1928).—With the usual technic and a 0.01 satd. soln. of $K_2Cr_2O_7$ the sensitiveness is 1:150,000. If the ppt. is dried with filter paper the sensitiveness is reduced to 1:110,000. MARY JACOBSEN

Home-grown rhubarb. M. RUSZKOWSKI. *Bull. pharm. Inst. Poland* **1928,** No. 1, 1–16.—Chinese (Shenzi) rhubarb (I) thoroughly pulverized gives on extn. with abs. alc. in the Soxhlet app. 61.53% ext, whereas the different species of rhubarb (II) cultivated in Poland between 1918 and 1922 gave 17.70–20% ext. On extn. of I and II with ether 15.45% and 4.40–6.53% exts., resp., contg. mainly hydroxymethylanthraquinone were obtained. JAROSLAV KUČERA

Simple and quick micro methods for tobacco analysis. I. Microtitrimetric determination of nicotine. J. BODNÁR, JOHANN STRAUB AND VITÉZ LADISLAUS NAGY. *Biochem. Z.* **195,** 103–17(1928).—To 10 cc. of an ether-petroleum ether soln. of nicotine are added 10 cc. 0.01 *N* HCl, 10 cc. H_2O and a drop of methyl red (prepd. by adding 0.01 *N* NaOH to the solid dye until only a small quantity remains undissolved) and the titration is made with 0.01 *N* NaOH under vigorous stirring until a yellow color appears. One cc. 0.01 *N* HCl is equiv. to 1.62 mg. nicotine. Another procedure is to set free the nicotine from 1 g. tobacco powder with 1 g. $Ca(OH)_2$ and to ext. the nicotine with toluene instead of ether-petroleum ether mixt. and titrate as before. S. MORGULIS

Galenical valerian preparations. E. H. MADSEN. *Dansk. Tids. Farm.* **2,** 177–83 (1928).—In valerian roots the active principle is present in amts. from 0.5 to 1% and consists chiefly of bornyl valerate, bornyl formate, acetate and butyrate, *l*-pinene, *l*-camphene, etc., in addn. to a variable amt. of free valeric acid. During drying the alkyl salts sep. and free valeric acid is formed. In fresh (green) roots no valeric acid is present. Some concd. valerian prepns. intended to give by simple diln. a product similar to infusions were examd. and the oil content of the prepns. was estd. A prepn. 1:3 made by suitable percolation with 10% alc. seems to be suitable for this purpose; it contained 20.6% of the oil of the root, whereas simple infusion contained 16.7%. Pilular exts. made by the method of Dutch Pharm. and by a method whereby the oil was removed by steam distn. and afterwards mixed with the ext. contained approx. 50% of the oil. The aq. layer from oil distn. must be used afterwards for extn., as it contains much oil. M. Lind in discussing M.'s lecture stated that valerian roots grown in warm dry weather have a higher oil content, but a lower ext. content than roots grown in cold wet weather, in which the conditions are just the reverse. C. Schousen mentioned that contrary to certain discussions relative to the repercolation method for valerian roots, C. Lewis Diehl's repercolation method (Ph. U. S. A. 1926) gives good results. O. A. NELSON

Determination of morphine in aqueous solutions. H. BAGGESGAARD-RASMUSSEN AND SVEND AAGE SCHOU. *Dansk. Tids. Farm.* **2,** 233–41(1928).—Take 20 cc. of soln. (corresponding to a morphine content of 0.1–0.2 g.) and shake with 3 vols. of $CHCl_3$ and 5 cc. of a 4% $NaHCO_3$ soln. in a separatory funnel. The vol. of extraction mixt. should be equal to the vol. of the aq. soln. As soon as the 2 liquids have sepd. after 1 min. shaking, draw off the org. layer as quickly as possible to prevent crystn. of morphine. Repeat the extraction twice more. Filter the combined ext., evap. to dryness on the H_2O bath, dissolve the residue in 10 cc. of 0.1 *N* HCl, if necessary, with gentle warming. Cool, add 15 cc. of H_2O, 2 drops of methyl red indicator soln., and 1 drop of a 1:1000 soln. of methylene blue. Titrate the excess acid with 0.1 *N* borax soln. until the color changes to green. Check analysis of aq. solns. of morphine salts of solns. contg. 10% tinct. coccinellae or 50% glycerol have given satisfactory results. O. A. NELSON

Present status of the evaluation of pyrethrum. J. CHEVALIER. *Ann. fals.* **21,**

318–23(1928); cf. *C. A.* **22**, 2433.—A discussion of the uselessness of chem. analysis as a method of detg. the activity of pyrethrum, with a plea for the adoption of a suitable biol. method of assay. A. PAPINEAU-COUTURE

Some British East African oils of geranium. L. S. GLICHITCH AND CHARLES MULLER. *Chimie & industrie* Special No., 478–81(April, 1928).—See *C. A.* **22**, 1016. A. PAPINEAU-COUTURE

Identification of cedrene by oxidation with permanganate. L. S. GLICHITCH AND R. NAVES. *Chimie & industrie* Special No., 482–3(April, 1928).—Cedrene-glycol prepd. *via* Semmler and Hoffmann (*C. A.* **2**, 106) and by the Chiris modification thereof (*C. A.* **19**, 2726) both had a m. p. 167.5–168° (Semmler and Hoffmann reported 160°). The former method gave only about 16% of the yield of the latter; but, contrary to what G. and N. had expected on account of the 8° difference in published m. p. by the 2 methods, the prolonged heating at high temp. in the Semmler and Hoffmann method does not cause a complete isomerization of the glycol during distn. A. P.-C.

The chemical constitution of various compounds having a musk odor. R. DELANGE. *Chimie & industrie* Special No., 484–95(April, 1928).—A review dealing with civetone, muscone, ambrettolide and the chief artificial musks. A. P.-C.

Citronellol and rhodinol. ANON. *Parfums de France* **6**, 234–40(1928). (In French and English.)—A review of the structural relationship between citronellol and rhodinol. A. P.-C.

Comparative determinations of the alkaloid content in drugs according to the testing procedures of the Finnish pharmacopeia and those of Dieterle. ERNST JÄGERHORN. *Farmaceutiskt Notisblad* **36**, No. 3, 6 pp.; *Chem. Zentr.* **1927**, II, 1061.—The drugs cortex Chinae (I), radix Ipecacuanhae (II), semen Strychni (III), opium (IV) and folia Belladonae (V) were tested for their alkaloid content according to the method given in the Finnish pharmacopeia V and by the method of Dieterle, which is designed for use with small quantities. The results were as follows: With I the two methods gave concordant results, even though $12^1/_2$ times less material was used in the second method. With II the second method gave a 0.61% higher value using 10 times less material; and III it gave 0.2% higher values using 15 times less material; with IV it gave 0.08% higher values using 23 times less material; and with V it gave 0.052% higher values using 4 times less material. J. S. REICHERT

The influence of alcohol on the decomposition of narcotic ether and testing the latter with phenolphthalein according to Stamm. EINO TIKKANEN. *Pharmacia* **1926**, No. 5, 7 pp.; *Chem. Zentr.* **1927**, II, 1496.—T. investigated the question as to how much alc. may be added to narcotic ether for preservation purposes and obtained the following results: "Kahlbaum" narcotic ether with 2% alc. decompd. in daylight as rapidly as ether free from alc.; an alc. content of 3% accelerated the decompn.; and 5% of alc. had an even greater decompg. effect. "Schering" narcotic ether with an alc. content of $^1/_2$, 1 and 2% decompd. more slowly than ether free from alc. The addn. of 1% alc. had the highest preservative action on ether. Ether with 3% alc. decompd. as rapidly as alc.-free ether and 5% alc. accelerated decompn. Both kinds of ether without alc. and with the addn. of up to 5% alc. showed no decompn. in the dark in 30 weeks. Narcotic ether should not contain more than 1% alc. If more alc. is needed for narcotic action it should be added immediately before using. For testing ether for H_2O_2 and dihydroxyethyl peroxide T. recommends only the phenolphthalein test of Stamm, and for AcH and vinyl alc. only the Nessler test, since neither is affected by the presence of alc. In this respect a change in the testing procedure is recommended for the Pharmacopeia. J. S. REICHERT

Notices on the oils of citronella. A. RECLAIRE. *Riechstoffind.* **1927**, 73–6; *Chem. Zentr.* **1927**, II, 1405; cf. *C. A.* **22**, 1346.—A comprehensive review on the types and sources; growth, harvesting and distn.; and methods of tech. analysis. Celebes citronella oil has the following properties: d_{15}, 0.8919–0.8950; α_D, —0.5 to —3.2°; n^{20}_D, 1.4691–1.4712; sol. in an equal vol. of 80% alc.; total geraniol, 85.1–92.6%; residue on distn. above 250°, 5.8–9.6%. J. S. REICHERT

The crystalline perfumes as fixators in the perfume industry. I. CLEMENTE. *Riechstoffind.* **1927**, 77–8; *Chem. Zentr.* **1927**, II, 1405.—A further discussion of methyl anthranilate, Me ester of methylanthranilic acid, naphthol ether, methyl cinnamate, benzyl cinnamate, diphenylmethane, diphenyl oxide, β-naphthyl methyl ketone, *p*-cresyl phenylacetate, phenethyl phenylacetate, phenethyl cinnamate and benzoyleugenol with reference to their use in perfumes. J. S. REICHERT

Concentrated lemon juice. GIOVANNI ROMEO. *Riv. ital. essense e profumi* **1928**, 20–1.—The perfume of lemon juice is due to citral and other aldehydes, to linalyl acetate, geranyl acetate and free alc. In commercial deterpenized lemon juice there are 40–

52% of citral and 16–20% of ethers. In qualities of guaranteed purity 63–67% citral and 15–16% ethers. Sesquiterpeneless lemon juice suffers during redistn., treatment with alc., etc., a loss in ethers. Because of its high content of citral and its rotatory power close to zero, sophistications are easy with mixt. of citral, lemongrass and other substances. The deterpenated product instead, has an accentuated levorotatory power (—5.00 to—8° 30′); it is difficult to imitate also through the presence of sesquiterpenes necessary for its levorotation. Sesquiterpenes are seldom found in commerce. Nor is it easy to find levorotatory products that can be substituted for sesquiterpenes. R. SANSONE

Choline content of the Danish insulin "Leo" and of vitamin B (American preparation). MARIA MAXIM. *Chem.-Ztg.* **52**, 711(1928).—On account of the observation that insulin injection is always accompanied by a blood-pressure reduction, M. analyzed samples of the Danish insulin "Leo" (5 cc. = international units) for choline. The qual. test with $PtCl_4$ in aq.-alc. soln. was positive; the quant. detn. as periodide gave 50.4 mg. choline per l. in one sample and 48.6 mg. in another. The choline content of an American vitamin B prepn. was 3.36 mg. %. G. SCHWOCH

Caswell Armstrong Mayo, 1862–1928. ANON. *Chemist and Druggist* **108**, 142 (1928).—Obituary, with portrait. Also see *Pharm. J.* **120**, 140, 238(1928). S. W.

The correlation of analytical data and accuracy in dispensing. P. A. W. SELF AND C. E. CORFIELD. *Pharm. J.* **120**, 144–8, 154–5; *Chemist and Druggist* **108**, 202–5 (1928).—The chief sources of discrepancies between the findings of the official analyst and practical accuracy in the compounding of medicines are: (*a*) Errors involved in measuring vols.; with small vols. the error may reach +8%. (*b*) The rigid single no. standards adopted by the Brit. Pharm., *e. g.*, for the strengths of dil. acids. The concd. Brit. Pharm. acids have fairly const. compn. between very narrow limits; the dil. acids prepd. from these by wt. show deviations of ± 5%; when dild. by vol., the errors are larger. The standard for strong $FeCl_3$ soln. is fixed at 20 g. Fe per 100 cc.; however, in 9 com. samples the % of Fe (wt./vol.) varied from 19.6 to 25.11% (d. 1.428–1.534). The Brit. Pharm. also fails to allow for deterioration of drugs in storage (cf. Evers, *C. A.* **20**, 2390), *e. g.*, by efflorescence, as with quinine sulfate which in 9 samples showed an av. gain in strength of 5% through loss of water. The adoption by the Brit. Pharm. of permissible limits of variation is urged. S. WALDBOTT

Antileprotic drugs. BURROUGHS, WELLCOME AND COMPANY. *Pharm. J.* **120**, 209(1928).—*Alepol* is a well-defined compd. so named to avoid confusion with the various Na hydnocarpates, chaulmoogrates, gynocardates, etc., of the market. It is a mixt. of Na salts of a fraction of the fatty acids of hydnocarpus oil, selected so as to retain the therapeutic efficiency of the salts of the total acids, but to be devoid of their irritant properties. S. WALDBOTT

Some reactions of pharmacology on pharmacy. H. H. DALE. *Pharm. J.* **120**, 245–50, 254; *Chemist and Druggist* **108**, 351–2(1928).—See *C. A.* **22**, 2637. S. W.

Narcotine sesquisulfate. D. B. DOTT. *Pharm. J.* **120**, 292, 301; *Chemist and Druggist* **108**, 451(1928).—When narcotine (*A*) is treated with H_2O and sufficient H_2SO_4 to form the normal salt, part of the alkaloid remains persistently undissolved. The addn. of half as much acid again effects complete soln. On evapn., a cryst. mass is formed which seems to have the compn.: $A_4.3H_2SO_4.6H_2O$. S. WALDBOTT

Some galenical preparations of the British Pharmacopeia. PETER BOA. *Pharm. J.* **120**, 292–3, 301–3; *Chemist and Druggist* **108**, 451(1928).—Sp. suggestions are made for the improvement or the elimination of certain galenical prepns. S. WALDBOTT

Notes on pharmacopeia revision; (a) podophyllum resin, (b) chrysarobin (c) assay of tincture of belladonna. D. B. DOTT. *Pharm. J.* **120**, 293, 301–3; ALFRED KING. *Ibid* 365; *Chemist and Druggist* **108**, 451–2(1928); cf. *C. A.* **22**, 2241.—(*a*) In the (implied) U. S. P. test for *emodi resin*, the proportion of KOH should be doubled so as to produce the required degree of gelatinization. The test should be adopted by the Brit. Pharm. (*b*) D. finds the soly. of chrysarobin (*A*) in alc., C_6H_6 and $CHCl_3$ to be, resp., 1:900, 1:70, 1:22; U. S. P. gives, resp., 1:385, 1:30, 1:13. These wide discrepancies are caused by difference of method in detg. soly. D. added solvent gradually until the substance was dissolved; in U. S. P. the substance in excess is shaken with a given vol. of solvent and an aliquot of the satd. soln. is evapd. Since *A* is a mixt. of compds. of varying soly., the U. S. P. method cannot give the true soly. of *A*. (*c*) In order to avoid emulsion of $CHCl_3$ with the concd. tincture, and formation of resinoid clots which occlude alkaloidal salt, evap. 100 cc. of Brit. Pharm. tincture to 40 cc., mix well with 2 g. kaolin, add 5 drops of AcOH and 70 cc. H_2O, mix well, break down the lumps, filter into a separator and wash the residue. Add 1–2 drops of tincture of cochineal, then sufficient NH_3 to alky., ext. with 4 portions of $CHCl_3$, filter, evap. and titrate with

0.05 *N* acid. K. proposes to shake out the green resinous matter with CS_2, which effects quick sepn., then to remove CS_2 with $CHCl_3$. The resulting soln. of the alkaloids is light brown, yielding a colorless, partly cryst. alkaloidal residue. S. WALDBOTT

Pharmacopeia revision: Reintroduction of Imperial weights and measures. HENRY STOUT. *Pharm. J.* **120**, 293–4, 301–3; *Chemist and Druggist* **108**, 452(1928).—A plea for the reintroduction of these wts. and measures, because of practical necessity; seconded in discussion. S. WALDBOTT

Pharmacopeia revision: The official liquors. GORDON PERRINS. *Pharm. J.* **120**, 294, 301–3; *Chemist and Druggist* **108**, 452–4(1928); J. R. Walmsley. *Pharm. J.* **120**, 364; Perrins, *Ibid* 439.—Suggestions for improvements of the official liquors, and deletion in some cases. S. WALDBOTT

Pharmaceutical education in Holland, with special reference to the University of Leiden. T. POTJEWIJD AND J. G. JONES. *Pharm. J.* **120**, 297–8(1928).—A description of the curriculum in pharmacy. S. WALDBOTT

Half a century of pharmacy (in London). T. H. POWELL. *Pharm. J.* **120**, 350–1, 369–71, 392–3(1928).—An autobiography, with historical notes. S. W.

West Australian sandalwood oil; a recent investigation. PERCY MAY. *Pharm. J.* **120**, 368–9(1928); cf. Marr, *C. A.* **22**, 138.—Tabulated results of analyses show that West Australian sandalwood oil is now obtainable of good standard quality, closely resembling the East Indian oil, and very different from the oil described by earlier authors. The alcs. in the oil show a striking similarity to the santalols of Mysore oil, but their identity is not fully established. Therapeutically the oil is in no way inferior to the East Indian oil; many clinical reports claim it to be superior. S. WALDBOTT

Johannes Gadamer, 1868–1928. ANON. *Pharm. J.* **120**, 384, 408(1928); *Schweiz. Apoth. Ztg.* **66**, 215–6(1928).—An obituary. S. WALDBOTT

The esterification of ethyl alcohol in citric acid solution. C. W. CORNWELL. *Pharm. J.* **120**, 391(1928).—In a lemon oil flavoring mixt. contg. 49.8% alc. (by vol.) and 25.5% citric acid, considerable esterification took place in 5 years; alc. became 38.9%, citric acid 12.46% (wt./vol.); sapon. showed 17.16% ester, indicating a quant. conversion of the disappeared alc. and acid; besides, the original quantities were recovered by sapon. and distn. The ester, $C_6H_5O_7Et_3$, does not hydrolyze nor distil to any appreciable extent when alc. and H_2O are distd. from a mixt. contg. it, nor can it be completely sepd. from alc. prepns. by means of petroleum ether. The free alc. in such a prepn. may be detd. by direct distn. if alkali and essential oils are absent; if both are present, by direct sepn. of the oil with the aid of brine, and distn. from the neutralized soln. S. WALDBOTT

Notes on three ointments. LENNOX TICE. *Pharm. J.* **120**, 391–2(1928).—To prep. *stainless I ointment, 5%*, dissolve finely powd. I, 1 part in warm oleic acid, 2 parts, add soft paraffin base, 17 parts and mix. In place of the stiff official *paraffin ointment*, T. suggests melting together beeswax, white or yellow, 1, hard paraffin 14, soft paraffin, white or yellow, 85 parts; stir until the mixt. congeals. A paraffin base should be used in Brit. Pharm. ointments in place of lard or suet, which in time turn rancid. In prepg. *mercurial ointment, 30%*, rub together Hg (30) with *hydrous wool fat* (20) and *oleic acid* (2) until the Hg is "killed," then add soft yellow paraffin (48 parts). The process is rapid and yields a "blue ointment" of good consistency. S. WALDBOTT

The adsorption value of surgical dressings. WALTER ZIMMERMANN. *Schweiz. Apoth. Ztg.* **66**, 13–8(1928); cf. *C. A.* **21**, 2050; **22**, 843.—In the place of the elaborate method of Demolis, a simple method of detg. the adsorbent qualities of a surgical dressing is proposed. Three nos. are detd.: (*a*) the *adsorption no.* (*AZ*), *i. e.*, the quantity of H_2O in g. adsorbed by 10 g. of the material, *e g.*, cotton; (*b*) the *sinking no.* (*SZ*), *i. e.*, the time (sec.) required for 10 g. of the material to sink in H_2O; (*c*) The *g.-min. no.* (*GMZ*) (by calcn.), *i. e.*, the no. of g. of H_2O adsorbed in 10 min. (600 sec.) by 10 g., of gauze, etc. For gauzes whose $SZ \gtreqless 600$ (which is the exception), $GMZ = (AZ/SZ) \times 600$. For gauzes whose $SZ \lesseqgtr 600$ (which is the rule), an arbitrary relation is given: $GMZ = AZ + (600 - SZ)$. In both cases when $SZ = 600$, $GMZ = AZ$. The 3 nos. were detd. for 65 samples of surgical dressings of all kinds; the results are tabulated. Av. normal values are for absorbent cotton: *AZ* 180–190, *SZ* 20–40, *GMZ* (calcd.) 720–750; for bandage linen ("Mull") *AZ* 60, *SZ* 10–20, *GMZ* 640. In exceptional cases, *e. g.*, the material being 15 yrs. old, *AZ* was 98, *SZ* 16,680, *GMZ* (calcd.) 3.5. S. WALDBOTT

Chemical valuation of arsenobenzenes. J. THOMANN. *Schweiz. Apoth. Ztg.* **66**, 37–40, 49–52(1928).—A critical survey of studies on the valuation of arsenobenzenes (*A*) based on their chem. and phys. properties (cf. *C. A.* **19**, 1756; **20**, 2561; **21**, 3104; **22**, 667). The German State keeps strict supervision of the quality of all *A* used in clini-

cal practice. The samples are centrally tested on the basis of a standard prepn. in regard to chem. compn., toxicity, curative value and clinical usefulness. As and S are detd., As by Kircher and Ruppert's method (*C. A.* **18**, 880); in neoarsphenamine the sulfoxyl group is also detd. T. detd. As by the method of Stollé and Fechtig (*C. A.* **17**, 2405) and found for Neoarsphenamine Höchst 19.5% As; Novarsenobenzene Billon 19.80%; Novarsol Burmann Genève 19.84% and Neo-Mesarca 914, Roche-Bâle 19.70%. The new Pharm. Helv. V may adopt besides neoarsphenamine Ag arsphenamine, Ag neoarsphenamine and Kolle's promising myoarsphenamine (*C. A.* **21**, 2032). It is hoped that a central testing lab. for this class of prepns. be established in Switzerland, and the Pharm. Helv. may simply give descriptions, soly., reaction of the soln. and a few qual. identity tests. A list of 13 references is appended. S. WALDBOTT

Pharmacy in Jugoslavia. VLADIMIR SIFFER. *Schweiz. Apoth. Ztg.* **66**, 94–6 (1928).—Informative. A new pharmacopeia is in prepn. to appear near the end of 1929. S. WALDBOTT

Products yielded by Solanaceae used as sensorial drugs. L. REUTTER DE ROSEMONT. *Schweiz. Apoth. Ztg.* **66**, 145–8(1928); cf. *C. A.* **19**, 2109.—A descriptive account is given of several drugs, mostly leaves which are smoked for their sensorial effects and are derived from species of *Hyoscyamus, Datura* and *Cestrum*. They are: *Pituri* (*petcherie*, etc.) made from the leaves of *Duboisia hopwoodii* F. v. Mull. by the natives of Central Australia; *tonga*, from *Datura sanguinea* (*Huacacachu, Yerba de Huaca, Bovachero*) used in Peru and Bolivia (Tschudi, 1838–42); *Datura stramonium* (*Jamestown weed*), together with *Arctostaphylos glauca* Ldl., *D. somniferum, D. meteloides* and *D. quercifolia* of Mexico, were smoked for their sedative and antiasthmatic effects by the N. American Indians; *Parqui*, from the leaves of *Cestrum parqui* L'Her. was used by the natives in Chile. In Siberia, a strong drink is prepd. by addg. leaves and crushed root of *Hyoscyamus niger* to fermenting beer. S. WALDBOTT

Phosphorated cod-liver oil. C. STICH. *Schweiz. Apoth. Ztg.* **66**, 169–71(1928).—Abstract of an address. The accepted standard for P content is 0.1 mg. per cc. Colorimetric detn. (*C. A.* **21**, 3856) showed in 18 samples from pharmacies an av. of 0.09 mg., in 8 com. samples 0.03 mg., in 4 com. samples 0.05 mg. per cc. S. WALDBOTT

Fenugreek. HUERRE. *L'évolution thérapeutique*, Dec., 1927; *Schweiz. Apoth. Ztg.* **66**, 182(1928); cf. *C. A.* **8**, 2601; **9**, 124; **13**, 2548, 2609, 3213; **20**, 2376; **21**, 2718.—Powd. fenugreek, rendered more palatable by removal of its oil, of a disagreeable odor, strongly stimulates general metabolism and aids assimilation. Its medicinal use is indicated in rickets, scrofula, anemia, etc. S. WALDBOTT

Table of injectable preparations, simple and compound formulas. ANON. *Schweiz. Apoth. Ztg.* **66**, 183–6(1928).—Ext. of a Report; cf. Lesure, *C. A.* **22**, 844. S. W.

Friedrich August Flückiger, 1828–1895. The centenary of his birth. SWISS APOTHECARIES UNION. *Schweiz. Apoth. Ztg.* **66**, 221–2(1928).—A memorial tribute, with frontispiece portrait of F. **His boyhood years.** AUGUSTA OESTERLE-FLÜCKIGER. *Ibid* 223–38.—With partly photostatic reprints of correspondence with his parents. **F. A. Flückiger, the historian of pharmacy.** J. A. HÄFLIGER. *Ibid* 239–46. **Memorial convocation at the University of Bern.** ALEXANDER TSCHIRCH. *Ibid* 262–5, 274–8 (1928).—Memorial address. S. WALDBOTT

The estimation of oil in extract of lemon. A discussion of the precipitation and polarimetric methods. The influence of temperature and aging upon the latter. C. V. NETZ. *J. Am. Pharm. Assoc.* **17**, 663–8(1928).—The U. S. P. X. tincture of lemon does not conform to the U. S. Dept. of Agr. Food Standards for ext. of lemon. Samples of lemon ext. of various strengths were made and assayed by the pptn. method. The method consists in adding H_2O to a known vol. of the ext. and centrifugalizing. A correction of 0.4% is added to the values found. N. finds that the best results are obtained when the entire length of the column of oil is measured rather than the vol. only. The correction factor of 0.4% is correct if the above procedure be followed. In the polarimetric method several factors must be considered. The α_D of lemon oils varies; EtOH is inactive but lemon oil dissolved in EtOH (5% sol.) loses about 8.5% of its activity. This must be allowed for if lemon exts. are to be assayed by the optical method. Since the rotation of pure lemon oil varies between 57° and 64° (generally between 59° and 62°) allowance must be made for this variable. The effect of temp. on the rotation of 5% exts. was studied. The variations in room temp. of 19–25° cause a max. error of but 0.07%. Aging of the exts. tends to cause an increase in rotation but the increase is not uniform in all exts.; so a factor cannot be calcd. from present knowledge. L. E. WARREN

The drug research unit and its value to the pharmaceutical industry. L. E. WARREN. *J. Am. Pharm. Assocn.* **17**, 737–44(1928).—An address. The Drug Research

Unit is a part of the Food, Drug and Insecticide Administration of the U. S. Department of Agriculture. Pharmaceutical manufacturers, schools of pharmacy and others are doing coöperative work with the unit in analytical methods for drugs. The drugs being studied are about 125 of those most used. L. E. WARREN

Cornin; a glucoside from Cornus florida L. EMERSON R. MILLER. Ala. Polytech. Inst. *J. Am. Pharm. Assocn.* **17,** 744–50(1928).—By the usual methods for obtaining glucosides, there was obtained from the root bark a white cryst. substance m. 182–3°, sol. in H_2O but sparingly sol. or insol. in the common org. solvents when cold, $[\alpha]_D$ —180.6° to —181.4°, neutral to litmus, extremely bitter; alkaloidal reactions are negative; N is absent; it reduces Bi salts in alk. soln. The action of emulsin indicates that cornin is a β-glucoside. Its carbohydrate nucleus contains *d*-glucose. It contains 1 Me group, and either an aldehyde group or one that is easily hydrolyzed with the formation of an aldehyde. L. E. WARREN

Notes on the assay methods of the U. S. Pharmacopeia X. T. F. PAPPE. U. S. Dept. Agriculture. *J. Am. Pharm. Assoc.* **17,** 844–8(1928).—Certain of the U. S. P. assays are criticized from the standpoints of inconsistency or faultiness, non-specificity for the material assayed, the use of indirect methods where direct methods might be employed, and methods which might be replaced or supplemented by other and better methods. Forty suggestions for improvement are made. L. E. WARREN

Gambier (KÖRNER) **29.** Classification of neutral glasses (BARONI) **19.** The soluble substance yielded by neutral glass in relation to its action on solutions for injection (BARONI) **19.** Ampoule glass and p_H (ISSOGLIO) **19.** Proof of the decomposition of linseed oil (JÄGERHORN) **26.** Preparation for progress (BEAL) **13.** Determination of atropine in the presence of morphine (WARREN) **7.** Report on [the determination of] ether (SPENCER) **7.** Shark-liver oil [use in pharmacy] (Brit. pat. 284,657) **27.** 1-Phenyl-3,4-trimethylenepyrazolone (U. S. pat. 1,685,407) **10.** Depilatory (Brit. pat. 285,152) **29.**

DEFACQZ, ED., AND WEITZ, R.: **L'officine de Dorvault, ou Répertoire général de pharmacie pratique.** Paris: Vigot Frères. 2014 pp.; F. 125. Reviewed in *Bull. soc. hyg. aliment.* **16,** 365(1928).

Therapeutic composition. CHARLES F. AMACKER. U. S. 1,686,062, Oct. 2. A compn. which may be locally applied as a bactericide is formed of salicylic acid 1 lb., a Hg deriv. of dibromofluorescein such as a 2% "mercurochrome" soln. 5 oz. and tincture of I 5 oz.

Synthetic drugs. SCHERING-KAHLBAUM A.-G. Brit. 285,001, Feb. 8, 1927. The CH_2O bisulfite compds. of 3-amino-4-auromercaptobenzene-1-sulfonic acid, *N*-α(β'-aminopyridyl)-4-amino-2-auromercaptobenzene-1-sulfonic acid and 3-amino-4-argentomercaptobenzene-1-sulfonic acid are made by treatment of their Na salts with Na formaldehyde bisulfite. 3-Amino-4-auromercaptobenzene-1-sulfonic acid is made by treating the diazo compd. of 2-nitroaniline-4-sulfonic acid with KCNS, reducing and then introducing Au into the thio group. *N*-α(β'-Aminopyridyl)-4-amino-2-auromercaptobenzene-1-sulfonic acid is made by reaction of the Na compd. of 4-amino-2-mercaptobenzene-1-sulfonic acid with α'-chloro-β'-nitropyridine, reduction and introduction of Au.

Coating for pills. S. HERMANN and PHARMACEUTISCHE WERKE NORGINE A.-G. Brit. 285,091, Feb. 12, 1927. Pills intended to pass through the stomach and to dissolve in the intestine are coated with stearic acid or similar aliphatic acid of low m. p. Other coating materials also are mentioned.

Aldehydes. I. G. FARBENIND. A.-G. Brit. 284,458, Jan. 19, 1927. Unsatd. aldehydes are prepd. by condensing an aldehyde having a CH_2 group in the 2-position to the keto group with an aldehyde of other character, in the presence of an alkali, an alc. and a minimum quantity of water. The products may be used as perfumes. Examples are given of the production of PhCH:CMeCHO, PhCH:CEtCHO, PhCH:C-(iso-Pr)CHO, *p*-$MeOC_6H_4CH$:CEtCHO, *p*-MeC_6H_4CH:CAmCHO, BuEtCHCH:CAmCHO, PrCH:CEtCH:CAmCHO, PhCH:CHCH:CEtCHO, PhCH:CHCH:CMeCHO, PhCH:CHCH:CAmCHO, PhCH:CMeCH:CMeCHO and PhCH:CMeCH:CEtCHO. Various other condensations also are referred to.

Alkaloids. A. BOEHRINGER (trading as C. H. Boehringer Sohn). Brit. 285,404, Feb. 15, 1927. Dihydromorphine is made by demethylating tetrahydrothebaine,

which may be produced by hydrogenating thebaine. The treatment may be effected in stages, in the last of which HBr may be used as the demethylating agent. Numerous details are given.

Tubes of radioactive material for therapeutic purposes. A. FISCHER. Brit. 285,467, Feb. 19, 1927. Structural features.

Hormones. SCHERING-KAHLBAUM A.-G. (formerly Chemische Fabrik auf Actien, vorm. E. Schering). Brit. 285,402, Feb. 15, 1927. Hormones such as those obtained from ovaries by extn. with MeOH and evapn. of the solvent are treated with alc. to remove albuminous substances, the alc. is evapd., the residue taken up with water and the suspension rendered alk. and extd. with ether. After evapn. of the ether, the residue is extd. with cold acetone or MeOH and the remaining lipoids are sapond. after removal of the solvent.

Tuberculin. I. G. FARBENIND. A.-G. Brit. 285,087, Feb. 11, 1927. Tuberculin prepns. are treated with precipitants such as dialyzed $Fe(OH)_3$ or Pb salts to remove albumins and their cleavage products and leave a soln. contg. active constituents which may then be sepd. by addn. of acetone, an alc. or of an alkaloid precipitant which is afterward eliminated. Various details are given.

Antirachitic preparations. W. MERCK, K. MERCK, L. MERCK, W. MERCK and F. MERCK (trading as the Firm of E. Merck). Brit. 285,083, Feb. 12, 1927. The unsaponifiable constituents of "low fungi" or of yeast-fat are esterified and the ester is treated with ultra-violet light, or ergosterol is treated with ultra-violet light and the activated product is then esterified. When the acetic ester of ergosterol is treated, there results a yellowish resinous substance sol. in alc. and oils and various other solvents.

Extracts from glands of sharks, etc. A. EHRENREICH. Brit. 284,668, Feb. 3, 1927. Products "of the nature of enzymes," which may be used for treating skins before tanning, ungumming silk, as medicines for raising blood pressure or causing contraction of organs and for anaesthesia are prepd. by degreasing and extg. glands such as those under the esophagus, the first intestinal gland, genital glands and other glands. Numerous details are given.

Bile acid salts of cephaeline alkyl ethers. ERNST ROTHLIN and FRITZ MÜLLER (to Chemical Works formerly Sandoz). U. S. 1,686,930, Oct. 9. See Brit. 283,553 (*C. A.* 22, 4131).

Barbituric acid derivatives. I. G. FARBENIND. A.-G. Brit. 285,598, Dec. 7, 1926. Barbituric acids contg. alkinyl groups are prepd. according to the usual esterification methods for the production of barbituric acids, but using alkinyl esters for alkyl esters. Examples are given of the production of isopropylpropargylbarbituric acid, isopropylmethylpropargylbarbituric acid and propargyldiethylmethinebarbituric acid. The products are *soporifics*. Isopropenylpropargyl bromide is made by treating isopropenylacetylene with Mg Et bromide, reacting on the product with CH_2O to form isopropenylpropargyl alc. and then forming the bromide by treatment with PBr_3.

Ichthyol substitutes. N. G. SHCHEKOLDIN. Russ. 4,557, Sept. 15, 1924. Ichthyol substitutes are obtained by distg. bituminous shale with S, pyrite or the mined substance itself with exclusion of air.

Medicinal baths. C. DRANGSHOLT. Brit. 285,356, Feb. 12, 1927. Alkali humates such as those of Na and Li are used in prepg. medicinal baths. Humic acid is obtained from peat by crushing, disintegrating with water and heating to 100°, or by freezing followed by heating, followed by extn. with alkali and pptn. with acid. Other details also are given.

Surgical suturing and bandaging material. MARIA, COUNTESS VON LINDEN. Brit. 285,464, Feb. 17, 1927. Material for surgical purposes is rendered sterile and antiseptic by impregnation with Na_2SO_4, Cu glyceride, Cu sulfide, cuprosol or cuprosol and methylene blue. Cumene may also be used for treating material such as catgut.

Synthetic perfumes. J. D. RIEDEL A.-G. (to F. Boedecker). Brit. 284,199, Jan. 24, 1927. *m*- and *p*-Ethylprotocatechuic aldehydes are made by treating safrole or camphor oil with alc. alkalies as described in Can. 275,947 (cf. *C. A.* 22, 1597) but ethylating the product instead of methylating it. Sepn. is effected as the propenyl pyrocatechol ether contg. the alkyl radical in the *p*-position to the propenyl group is more difficultly sol. than the corresponding *m*-compds.; also the alkali salts and the acidyl compds. of the propenyl pyrocatechol ether ethylated in the *m*-position are more difficultly sol. than the *p*-compds. and the *m*-ethylprotocatechuic aldehyde dissolves more easily in alkali carbonates than the *p*-compd. Examples are given.

Cosmetics containing dyed starch and powdered talc or similar substances. A. O. MORRIS. Brit. 284,830, Dec. 23, 1926. The starch used may be dyed by spraying with an aniline dye soln.

Disinfectants. PAUL JAMOTTE. Fr. 635,683, June 9, 1927. See Brit. 272,900 (*C. A.* 22, 1833).

Cleansing nicotine vapors. ROBERT G. MEWBORNE. U. S. 1,684,740, Sept. 18. A stream of vapors contg. nicotine and impurities is treated with an alkali soln. such as NaOH and the temp. is maintained (suitably at about 100° or higher) to prevent condensation of the nicotine and the latter is subsequently recovered from the vapors.

Accelerated fermentation of cigaret tobacco. M. D. KOLENEVA. Russ. 4168, Sept. 15, 1924. Leaf and crumbled tobacco with a moisture of about 28% is gradually heated up to 60–80° for 12 hrs. in closed chambers and left for another 12 hrs. at the same temp.

18—ACIDS, ALKALIES, SALTS AND SUNDRIES

E. M. SYMMES

Manufacture of synthetic nitric acid from nitrogen oxides under pressure. V. I. MALYAREVSKII AND V. V. PAPKOV. *J. Chem. Ind.* (*Moscow*) 5, 682–9(1928); cf. Malyarevskii, *C. A.* 20, 3333; 21, 3712; 22, 3266.—Under normal factory conditions NH_3 reacts with air in the zone of contact, conforming to the reaction $4NH_3 + 5O_2 = 4NO + 6H_2O$, the yield of NO being about 90%. NO is subsequently transformed by the air into NO_2 or N_2O_4, which may be converted into HNO_3 by absorption in water: $3N_2O_4 + 2H_2O = 4HNO_3 + 2NO$; $3NO + 3NO_2 + H_2O = 2HNO_3 + 4NO$. There is a tendency to improve the existing absorption systems either by effecting a contraction of the size of the installation per unit of production (attained by increasing the intensity of contact between the gas and the liquid), or by the use of artificial cooling (cf. Toniolo, *C. A.* 13, 892). To bring about these improvements the only factors which have hitherto been considered are the temp. of oxidation, the temp. of absorption and the intensity of contact of the gas with the liquid; the concn. of NO and O_2 in the nitrogeneous gas, a factor of far greater importance, has been ignored. This concn. may be increased either by using O_2 instead of air in the oxidation of NH_3, or by operating under pressure. While the use of O_2 can only be considered in those localities where this gas is inexpensive, the use of pressure would be advantageous everywhere. When operating under pressure, the concn. of NO and O_2 in the gas increases and brings about the increase of the speed of NO oxidation almost in proportion to the square of the increase of pressure; at the same time the speed of NO_2 absorption also increases. When operating under pressure any desired degree of contact of the gas with the liquid can be attained and, by utilizing the expansion energy of the spent gas, cold may be produced, by means of which the speeds of NO oxidation and of N_2O_4 absorption may be still further increased. Finally, the use of pressure would permit the obtaining, as a final product, 65–67% HNO_3, instead of the 50–52% acid obtained at present. A drawing and a description of construction of a projected installation (plant) for effecting the absorption under pressure are presented. It is essential to be able to remove rapidly and completely the heats of NO oxidation and of absorption of N oxides in the course of the circulation of the gas through the system. The N oxides of the temp. of 150° or over, coming out after the contact, are led into a compressor where they are compressed to 10 or more atms. at 250–300°, after which they enter a water-cooled cooler where they cool off to below 50°; from there they go through a series of externally cooled tubular absorber-refrigerators where their oxidation and their absorption take place by the absorbing liquid. For the latter it is best to use the reaction water from the nitrogenous gas, but ordinary water could also be used. All the parts of the installation must be made of acid-proof metal (ferrosilicon or Cr steel). A detailed calculation of the fundamental elements of the installation is appended. As the construction of the tubular absorber-refrigerators permits the max. development of cooled surface at a min. of reaction space, a very compact app. results. The total capacity (vol.) of an installation working under a pressure of 10 atms. and intended to convert N oxides into HNO_3 with a 95% yield should only be equal to 2.5 cu. m. per ton NH_3 in 24 hrs. An additional absorber to obtain a mixt. of nitrite-nitrate by alk. absorption can be attached at the end of the system, *viz.*, after the refrigerators; in that case the efficiency of the plant could be increased and the necessary vol. (size) per 1 ton per 24 hrs. should not be greater than 1.5 cu. m. The expansion energy of the spent gas released from the compressed system may either be regenerated as such (pneumatic motor), or utilized to obtain the cold needed for cooling the end of the system; the purpose of the cooling is not only to accelerate NO oxidation and absorption of N oxides, but also to decrease the moisture content in the used up gas. The latter has the compn.: N 98.28, O_2

1.22 and NO 0.50% and can be utilized, after a slight purification, in the *manuf. of Ca cyanamide, synthetic NH_3*, etc., Fauser (cf. *C. A.* **22**, 3738) arrived almost simultaneously at *the same views concerning the use of pressure in the manufacture of HNO_3*. While Fauser and the authors agree on most points, there are fundamental differences concerning the following details: (1) Fauser conducts not only the absorption of N gases, but also the contact reaction under pressure; yet this is not advisable, as the greater the pressure the less efficient the NH_3 oxidation. (2) The absorber construction plans of the authors have the advantage over Fauser's column system app. of avoiding parts of large diam. (3) The authors prefer to use the expansion energy of the spent gas for refrigeration of the tail-end of the absorption system, their fundamental purpose being to effect the max. of intensification of the process and the max. diminution of reaction vols. BERNARD NELSON

Manufacture of sulfuric acid from gypsum. JAROSLAV MILBAUER. *Chemický obzor* **1**, 317–8; *Chem. Zentr.* **1927**, II, 968—Discussion of the principal processes. G. SCHWOCH.

Manufacture of carbon dioxide. H. E. HOWE. *Ind. Eng. Chem.* **20**, 1091–4 (1928).—A brief illus. description of the Dry Ice Corp. at Elizabeth, N. J. There are 3 units, each consisting of a coke-fired boiler, 2 scrubbing towers, 2 absorbing towers, a heat interchanger, a lye boiler and cooling coils. The compressor room works on gas from a common header of gas from a holder. A flow chart for the manuf. of solid CO_2 is shown. W. H. BOYNTON

Sulfur, pyrite and sulfuric acid. ARTHUR E. WELLS. *Mineral Ind.* **36**, 542–52 (1927).—A review, with statistics of production and trade. A. B.

Synthetic ammonia costs in America. R. S. TOUR. *Chem. and Met. Eng.* **35**, 89–91, 162–4(1928).—Tabulations in very great detail show the production cost from water gas to be 6.33 cents and from electrolytic H_2 as 6.75 cents per lb. of NH_3. E. M. SYMMES

Note on the formation of ammonia from active nitrogen and active hydrogen. BERNARD LEWIS. *J. Am. Chem. Soc.* **50**, 2427(1928); cf. *C. A.* **22**, 668.—Koenig and Elöd (*Z. Elektrochem.* **21**, 285) obtained negative results in the synthesis of NH_3 from H_2 and N_2 after each had been activated separately in the elec. discharge, contrary to the results of L. This discrepancy is explained by the recombination of at. H before reaching the mixing point, a condition favored by the higher gas pressures used in the expts. of K. and L. H. R. MOORE

Considerations on the choice of a process for the synthesis of ammonia. CAMILLE MATIGNON. *Chimie et industrie* **20**, 365–7(1928).—A brief discussion showing the advantages of high-pressure (Claude) over low-pressure (Haber) processes. A. PAPINEAU-COUTURE

The consumption of raw materials in the ammonia-soda process. II. JULIUS KIRCHNER. Kispest, Ungarn. *Chem.-Ztg.* **51**, 746–8(1928); cf. *C. A.* **21**, 2760; **22**, 482.—In the modern NH_3-soda plant, 0.3 to 0.4 kg. $(NH_4)_2SO_4$ are lost for every 100 kg. of product. This loss occurs in the exit gases, the foots, leaks and from the furnaces. The total lime consumption in the production of 100 kg. of 98.8% Na_2CO_3 is 58.35 kg., whereas the theoretical is 52.2 kg. The theoretical and practical consumption of coal for the whole process is also discussed. J. H. PERRY

The action of alkalies and alkaline salts on fuller's earth. OTTO ECKART. *Ölmarkt* **9**, 129–30; *Chem. Zentr.* **1927**, II, 1414.—It is impossible to neutralize activated, and therefore weakly acid, fuller's earth, with alkalies without a deteriorating effect. This is due to the pptn. of Fe and Al salts, the formation of silicates, and (with strong alkalies) the soln. of the silicates formed. J. S. REICHERT

The Blättner process for the manufacture of caustic soda from sodium carbonate. HIRCHBERG. *Chem.-Ztg.* **51**, 765(1927).—The process described is a modification of the Loewig process (Ger. pat. 203,271 (1923)). A part of the crude Na_2CO_3 is heated with Fe_2O_3. CO_2 is evolved and the residue is leached with H_2O to give a NaOH soln. The CO_2 is passed through a soln. of the crude Na_2CO_3 to ppt. $NaHCO_3$, which upon heating gives pure Na_2CO_3. The CO_2 is compressed and sold. The Loewig process required 300 parts of Fe_2O_3 to 100 parts of crude Na_2CO_3, while this modified process requires only about 150 parts of Fe_2O_3. The process is most efficient as regards fuel, labor and time. The problem of a suitable furnace for the metallic oxide treatment is not considered difficult. J. H. PERRY

Potash. J. W. TURRENTINE. *Mineral Ind.* **36**, 477–90(1927).—The industry in the U. S. and foreign countries is reviewed. A. B.

The lime-burning process. GUSTAV F. HÜTTIG AND MATHIAS LEWINTER. *Z.*

angew. Chem. **41,** 1034–43(1928).—During the greater part of the CO_2 evolution there are 3 phases: completely unchanged $CaCO_3$, a phase of variable compn. and amorphous to cryst. CaO which apparently contains variable but small quantities of CO_2 in its structure. According to the phase rule these 3 phases cannot co-exist under the given conditions. The unstable phase is the unchanged $CaCO_3$ with its very slow decompn. velocity at the ruling CO_2 pressures. The 2 other phases and the CO_2 evolved at const. pressure are components of a system of equil. in which the phase comprising unaltered $CaCO_3$ does not play the role of a component. E. M. Symmes

Replacing lime by iron sesquioxide in the manufacture of sodium chromate. F. F. Volf and L. I. Popov. Northern Chem. Trust. *J. Chem. Ind. (Moscow)* **5,** 618–25 (1928).—In the manuf. of Na_2CrO_4 according to the reaction $4FeCr_2O_4$ (chromite) + $8Na_2CO_3 + 7O_2 = 8Na_2CrO_4 + 2Fe_2O_3 + 8CO_2$, CaO is used to prevent fusion of the mass at the high temp. (1100–1200°). The mass must remain porous to insure access of air to all particles of the Cr ore to be oxidized. The use of CaO, which is not supposed to take part in the reaction, is objectionable because it gives a lime product which cannot be utilized and also because it causes a loss of some Cr as $CaCrO_4$, which cannot be extd. by leaching with H_2O (*C. A.* **20,** 2564). Moreover, some CaO dissolves with the Na_2CrO_4 and contaminates the latter. The possibility of replacing CaO by Fe_2O_3 was suggested by (1) a by-product consisting of Fe_2O_3 which could be briquetted and used as an Fe ore or in Fe oxide paints; (2) Na ferrite, possibly formed in the reaction, is a very strong alkali which may contribute substantially to the successful decompn. of chromite; (3) in the oxidation of chromite at the high temp. Fe_2O_3 could be expected to act catalytically as an O carrier. Such use of Fe_2O_3 is shown in German patents 82,980 (Oct. 10, 1894) and 166,767 (Sep. 11, 1904) and *C. A.* **21,** 3428. In all, 56 expts. were run. Heating took place in a Hereaus elec. furnace, the temps. were measured by a Pt-PtRh thermocouple, the chem. control consisting in detg. the percent of decompn. of chromite and Cr extn. Thirteen tables show the effect of the degree of purity of Fe_2O_3, time of ignition, fineness of materials, amt. of Na_2CO_3 used, etc. When employing CaO the latter is commonly used in amts. equal to the wt. of chromite and Na_2CO_3 in amts. required theoretically to form Na_2CrO_4. The ore is ground to pass a No. 120 screen, the temp. is 1100° and time of calcination 1.5 hrs. If CaO is merely replaced by Fe_2O_3, all other conditions remaining the same, the conversion is lowered sometimes more than 20%. When using Fe_2O_3 much better yields are obtained by increasing the Na_2CO_3, grinding more finely and increasing the time of calcining, because any SiO_2 present must be satd. When using CaO part of the latter is consumed in this way, whereas with Fe_2O_3 the Na_2CO_3 is consumed and its quantity must be increased but not above 1.3 times that required theoretically to form Na_2CrO_4. Otherwise the mass might fuse at 1100° and decrease the oxidation greatly. With this 1.3 times increase of Na_2CO_3, all other conditions remaining the same, the per cent Cr extn. is equal to that by the CaO method, or 93.2%, if pure Fe_2O_3 is used. With hematite or calcined pyrite the Cr extn. is 89.2 and 83.2, resp. Pyrite cinders give low Cr oxidation because it does not prevent the mass fusing at 1100° or even lower when a 20% Na_2CO_3 excess is used. Below 1000° the mass can be kept porous even with 1.5 times the theoretical excess of Na_2CO_3, with a Cr extn. of 88.3%. Even when using only a 30% Na_2CO_3 excess excellent yields can be obtained if the materials are put through a No. 200 screen; with pure Fe_2O_3 95.9% after 1.5 hrs. and 97.5% after 4.5 hrs., with red hematite 92.1% after 1.5 hrs. and 94.4% after 4.5 hrs., with calcined pyrite and a lower temp. 87.4% after 1.5 hrs. and 94.1% after 4.5 hrs. A calcn. shows that the cost of Na_2CrO_4 by the Fe_2O_3 process is considerably lower than that by the CaO method. In the new process there are 2 stages, calcination of chromite with one-half the Na_2CO_3 required theoretically for decompn., and calcination with additional Na_2CO_3 of the first product after subjecting it to a water treatment to ext. the Na_2CrO_4 formed. Bernard Nelson

Sodium salts. Alan G. Wikoff. *Mineral Ind.* **36,** 532–41(1927).—Nitrate, fixed nitrogen, salt, carbonate and sulfate are discussed, including production and technology. A. B.

Purification of technical ammonium bicarbonate. W. Gludd and W. Riese. *Ber. Ges. Kohlentechn.* (Dortmund-Ewing) **2,** 259–67; *Chem. Zentr.* **1927,** II, 2250.—NH_4HCO_3 obtained from the mining industry is not pure white, but is yellowish brown to gray on account of inorg. and org. impurities. An *app. and technic* are described, whereby the product is vaporized in the presence of active C at approx. 80°, the condensate being pure white. C. C. Davis

Barium carbonate. Thomas O. Marvin, *et al.* *U. S. Tariff Commission Rept.* **1928,** 18 pp.—Data are given on the uses, raw materials, methods of production, domes-

tic production and consumption, foreign production, imports, prices and costs of production in the U. S. and in Germany for barium carbonate. PAUL J. CULHANE

Purification of crude barium chloride by sodium chloride. I. E. ADADUROV AND K. I. BRODOVICH. Kharkov State Inst. of Applied Chem. *J. Chem. Ind.* (*Moscow*) **5**, 640–2(1928); cf. *C. A.* **22**, 3740.—The difference of soly. of $BaCl_2$ and $PbCl_2$ in HCl has been utilized for the purification of the former. As, however, the cost of HCl is high, an investigation was made of the soly. of $BaCl_2$ in aq. NaCl solns. of various concns. and various temps. A soly. table of $BaCl_2.2H_2O$ in 5, 15, 25 and 30% solns. of NaCl at 16°, 25°, 35°, 40°, 60°, 80° and 100° is given. The solubilities of $BaCl_2.2H_2O$ in NaCl solns. were compared with those in HCl of the same concns. and it was found that, when dealing with 25–35% solns. of either NaCl or HCl, the former are several times as great. It is remarkable that the soly. of $BaCl_2.2H_2O$ in NaCl solns. drops to a minimum at 35°; the reason for this phenomenon may be looked for in the dissociation of NaCl soln. at 35° and the consequent increase of Cl ions. A table of soly. of $PbCl_2$ at various temps. in various concns. of NaCl soln. is also given. It shows that the soly. of $PbCl_2$ increases with the increase of NaCl concns.; the reason must be attributed to the formation of the double salt $PbCl_2.2NaCl$. The formation of a double salt ($PbCl_2$.-2HCl) must also be assumed in the case of solns. of $PbCl_2$ in HCl. The solubilities of $PbCl_2$ in NaCl solns. of various concns. are nearly the same as those in HCl of the same concns. Thus the use of NaCl solns. for purification of $BaCl_2$ is perfectly justifiable. However, the main impurity of tech. $BaCl_2$ is PbS; the latter is converted into $PbCl_2$ when using concd. HCl as a solvent, but does not dissolve on being treated with NaCl solns. To purify technical $BaCl_2$ a 31° Bé. soln. of the latter was made and PbS was removed either by filtration *in vacuo* or by acidifying at 100° with HCl; to this hot soln. NaCl was added in the quantity of 250–270 g. per l., the soln. was cooled to 35–40° and the $BaCl_2$ which pptd. was filtered *in vacuo.* The ppt. was 99% $BaCl_2$ and was quite white; it represented 90% by weight of the total quantity of $BaCl_2$ originally contained in the soln. The filtrate contained 58–65 g. $BaCl_2$ and 258–265 g. NaCl, of which the former salt may be pptd. by H_2SO_4 and can find utilization as *blanc fixe;* the remaining soln. may be used in the next operation as pure NaCl soln. B. N.

Borax. PAUL D. V. MANNING. *Mineral Ind.* **36**, 64–8(1927).—Uses and sources of borax are discussed and statistics given. A. B.

The influence of the changed market situation of nitrogenous materials upon the production of Chile saltpeter. JAN HAMPL. *Chemický obzor* **3**, 169–72(1928).—The developmental possibilities of the Chile saltpeter industry are discussed on the ground of statistics of production and consumption of nitrogenous materials, with consideration of the new, more economic methods of recovering Chile saltpeter, especially the Guggenheim method. JAROSLAV KUČERA

Chile saltpeter or synthetic sodium nitrate. H. EDDELBÜTTEL. *Z. angew. Chem.* **41**, 309–14(1928).—A discussion of whether the I content of Chile saltpeter is such as to displace the use of other products in its favor. It is evident that as long as only possibilities for certain advantages of the Chile saltpeter exist and no definite proofs are at hand, the German saltpeter is to be preferred. E. F. SNYDER

The explosive properties of solid hypochlorite. JOSEF WEICHHERZ. *Chem.-Ztg.* **52**, 729–30(1928).—$Ca(ClO)_2$ was supplied in sheet lead containers for disinfection purposes. While being transferred to small boxes contaminated by an alc. soln. of beech tar soap the contents deflagrated. The original boxes remained intact. Closed, original containers often show as much as a 10% internal pressure at 25°, due to O_2 evolution. At 100° to 112° $Ca(ClO)_2$ decomposes rapidly and often violently. When mixed with dry org. substances there is no reaction at ordinary temp. but ignition below 100°. Dry mixts. of $Ca(ClO)_2$ and beech tar soap did not ignite, but when moist there was oxidation, chlorination and rise of temp. to the ignition point. $Ca(ClO)_2$ is not dangerous for disinfection purposes. Deflagration occurs only on strong heating or when mixed with combustible substances. E. M. SYMMES

Accidents in the production of lead bromate. WITT. *Zentr. Gewerbehygiene Unfallverhüt.* **14**, 342–3; *Chem. Zentr.* **1927**, II, 2384.—Two accidents which occurred in the prepn. of $Pb(BrO_3)_2$ from $Pb(OAc)_2$ and $KBrO_3$ are cause for warning that when $Pb(BrO_3)_2$ is made in this way the dangerously explosive diacetatoplumbobromate is formed. $Pb(BrO_3)_2$ prepd. from Pb salts and HBr and KBr or from $PbCO_3$ and HBr is much more safely handled. C. C. DAVIS

Evaluation of silicon carbide and synthetic corundum. H. DANNEEL. *Chem. Fabr.* **1928**, 164–7.—The manuf., properties and various grades of the carbide and of fused Al_2O_3 (artificial corundum) are described. Chem. examn. in both cases is difficult,

and not necessarily conclusive; reliance must be placed on the phys. properties and on microscopical examn. B. C. A.

Iron carbonyl and carbonyl iron. A. MITTASCH. *Z. angew. Chem.* **41,** 827–33 (1928).—Fe pentacarbonyl is produced on the large scale by circulating CO under pressure over sponge Fe at 150–200° and cooling the gases evolved. It has d_4^{20} 1.453, a surface tension of 22 dynes per cm. and a viscosity of 0.0075 c. g. s. unit at 20°. Its heat of formation (liquid) is 54.2 kg.-cal., latent heat of fusion 3.25 kg.-cal. per mol., and heat of combustion 384.5 kg.-cal. per mol. In alk. soln. it behaves as a powerful reducing and dechlorinating agent for org. compds. In pentane soln. it combines with Br, forming a yellow unstable compd. which rapidly decomposes with the evolution of CO and the formation of the reddish brown compd., $Fe(CO)_4Br_2$. Iron pentacarbonyl decomposes at 250° in a hollow vessel heated by radiation, yielding a finely divided Fe contg. about 1% C. If this is melted in a vacuum high-frequency furnace together with the requisite quantity of pure FeO, obtained by combustion of the carbonyl, an exceedingly pure Fe of high permeability, low hysteresis and small wattage loss is obtained. B. C. A.

Dyeworks sulfites from waste. E. T. ELLIS. *Dyer, Calico Printer* **60,** 60–1, 73 (1928).—The manuf. of $(NH_4)_2SO_3$, $CaSO_3$, $Ca(HSO_3)_2$, $CaMg(SO_3)_2$, K_2SO_3, $KHSO_3$, Na_2SO_3 and $NaHSO_3$ from by-product wastes is discussed. RUBY K. WORNER

Asbestos. OLIVER BOWLES. *Mineral Ind.* **36,** 40–8(1927).—A review of the industry, including sources of asbestos, outputs, properties and uses. A. B.

Fluorspar. HUBERT W. DAVIS. *Mineral Ind.* **36,** 206–10(1927).—An account of consumption, output and trade. A. B.

Fuller's earth. HERMAN GUNTER. *Mineral Ind.* **36,** 211–2(1927).—Statistics of production and trade are given. A. B.

Gypsum. W. M. MYERS. *Mineral Ind.* **36,** 278–83(1927).—Statistics are given, together with discussion of technology and mine and mill developments. A. B.

Magnesite. HUGH M. HENTON. *Mineral Ind.* **36,** 373–82(1927).—The magnesite industry, *Mg* and *alloys* are discussed with statistics and a bibliography. A. B.

Mica. ANON. *Mineral Ind.* **36,** 396–400(1927).—A review of the industry. A. B.

Monazite. ANON. *Mineral Ind.* **36,** 405–6(1927).—Statistics of production and imports are given. A. B.

Talc and soapstone. PETER A. MCGURK. *Mineral Ind.* **36,** 553–60(1927).—Production and research on properties and uses are discussed. A. B.

Phosphate rock. K. D. JACOB. *Mineral Ind.* **36,** 446–60(1927).—A discussion of production and technology, with statistics and a bibliography. A. B.

Arsenic. F. Y. ROBERTSON. *Mineral Ind.* **36,** 34–9(1927).—Production and uses are discussed. A. B.

Barium and strontium. CHARLES HARDY. *Mineral Ind.* **36,** 56–60(1927).—A statistical review of the industry. A. B.

Selenium and tellurium. S. SKOWRONSKI. *Mineral Ind.* **36,** 525–6(1927).—New uses are discussed and a bibliography is given. A. B.

Titanium and zirconium. J. W. MARDEN. *Mineral Ind.* **36,** 584–90(1927).—Sources and technical developments are discussed. A section on hafnium is included. A. B.

Extraction of bromine by solvent. II. B. G. PANTELEIMONOV. *J. Chem. Ind. (Moscow)* **5,** 484–9(1928); cf. *C. A.* **22,** 3741.—Kerosene is usually removed incompletely from $Br\text{-}H_2O$ after extn. A certain amt. of it is lost as an emulsion with H_2O, involving not only loss of kerosene but also the Br dissolved in it. With Br solns. in pure H_2O the loss of kerosene from emulsion formation is 1 to 2% after each extn., and the loss of Br caused by it is 14.1 to 26.1% after 15 extns. With natural Br waters, such as lake waters contg. much salt in soln., emulsions are apt to form which do not sep. a kerosene layer on standing. An elec. current would break these emulsions, but filtration through porous substances having great adsorptive power, such as sponges or clays, is simpler. Sponges become soaked with kerosene and need pressing only to recover it with a kerosene loss of not more than 0.5% per extn. Br dissolved in kerosene becomes converted into HBr during adsorption by a sponge, due to surface tension, so that the recovered kerosene contains no dissolved Br and can be used directly for a new dissolving operation without previous treatment with alkali, whereas the aq. soln. sepd. from the emulsion contains all its dissolved Br as HBr. The latter is formed in the aq. soln. during extn. of Br by kerosene. With decrease of concn. of Br in the water from gradual extn. the amt. of HBr formed increases.

The longer kerosene is agitated with the water the more Br is converted to HBr. Br can be set free again by Cl. A detailed calcn. shows the low cost of Br production by this method and 11 tables give various data. BERNARD NELSON

Bromine and iodine. ANON. *Mineral Ind.* **36**, 69–70(1927).—Production and sources are discussed. A. B.

Iodine and gelatiginous substances from Laminaria. B. PENTEGOV, R. NYANKOVSKII AND I. PLAKSIN. *Lab. allgem. physikal tech. chem. Staatl. Univ. fernen Ostens* **1927**, 121–5; *Chem. Zentr.* **1927**, II, 2405.—Analyses showed that *Laminaria japonica* contains 0.43–0.54% I and *Laminaria bullata* 0.38–0.41% I. The practical yield of I is up to 0.18% and of dry alginic acid up to 16.2%. C. C. DAVIS

New method for the immediate production of hydrogen under pressure in the laboratory or in the field in the absence of a supply of water. FERNAND LEFEBVRE. *Chimie et industrie* **20**, 231–2(1928).—H under pressure is produced by the action of ferro-Si on NaOH according to the reaction $Si + 2NaOH + H_2O = Na_2SiO_3 + 2H_2 +$ 170 cal. The reaction is carried out in a pressure bottle which can be easily charged with the chemicals and furnishes the gas under a pressure of 50 atm. or more. The increase in pressure caused by the confining of the gas would tend to limit the reaction but this is offset by the increase in temp. which rises to about 180° and permits the reaction to proceed to completion. The construction and operation of the app. are described. A. PAPINEAU-COUTURE

Gas manufacture for the filling of balloons. II. JAROSLAV MILBAUER. *Chemický obzor* **2**, 107–15; *Chem. Zentr.* **1927**, II, 968.—M. describes the manuf. of H_2 and He suitable for the filling of balloons and airships. H_2 is obtained by action of metals on acids or alkalies, also from H_2O or hydrocarbons. He is obtained from natural gas exclusively. The different methods of H_2 production and the processes of filling, purifying and transporting, as they are in use in different countries, especially for military purposes, are described. The production, transportation and recovery of He are discussed. G. SCHWOCH

The separation of krypton and xenon from atmospheric air. ADOLPHE LEPAPE. *Compt. rend.* **187**, 231–4(1928).—The methods used hitherto to sep. Kr and Xe from air give very low yields (2–6%). Both gases will distil O_2 in spite of their low vapor pressure. L. puts a tube of coconut charcoal or silica gel in the neck of a Dewar flask from which O_2 is distg. The gas adsorbed in the tube is freed from CO_2, O_2 and N_2. Yields of 86 to 100% of Kr and Xe were obtained with either the charcoal or the gel. G. C.

The commercial preparation of oxygen from lime and chlorine. O. R. SWEENEY AND A. W. RALSTON. Ia. State Col., Ames. *Proc. Iowa Acad. Sci.* **34**, 215(1927).—The reaction of Cl on a suspension of lime in the presence of suitable catalysts, such as Ni, Co and Fe salts, has been studied. It was found that the optimum temp. is 94°; that the greatest unit efficiency of the catalyst, Ni nitrate, is obtained at a concn. of 0.02 g. per 100 cc.; that the rate of generation of O_2 is almost directly proportional to the rate of flow of the Cl and that Ni and Co salts are distinctly superior to all other catalysts which were used. In addn. it has been found that the catalyst is not easily poisoned, and may be used throughout a no. of runs. An app. has been designed which is capable of producing pure O_2 from lime and Cl and which is capable of recovering the catalyst for further use. By the process Cl, now a drug on the market, is converted into $CaCl_2$ and yields O_2, both of which are in demand. W. G. G.

Preparation of carbon by decomposition of carbon monoxide. F. v. WANGENHEIM. *Brennstoff-Chem.* **8**, 385–8(1927).—Expts. are described wherein C is prepd. by the reaction $2CO \longrightarrow C + CO_2$ using metallic Fe as catalyst, the temp. being 450°. Kahlbaum's pure Fe is volatilized as $FeCl_3$ in a current of Cl at 200–250°. The $FeCl_3$ is dissolved and pptd. as $Fe(OH)_3$ with caustic alkali. The ppt. is washed, redissolved and repptd. with NH_4OH. The purified hydrated oxide is put into porcelain boats which are placed in a reaction tube heated to 450° electrically. The C which pptd. on the catalyst, reduced by CO, could with pure CO amount to 74% before the catalyst became inactive. When a mixt. of $CO:H_2 = 1:1$ was used the C could be increased to 96.2%. Attempts to free the C so prepd. from Fe by volatilization of the latter in Cl were only partially successful. Traces of Fe always remained in the C. This may have been due to the presence of small amts. of Fe carbides. J. D. DAVIS

Methods for the preparation of activated carbon. ADOLF BRÄUER AND JOSEF REITSTÖTTER. *Z. angew. Chem.* **41**, 536–9(1928).—The production of activated C is traced through its period of development by reference to specific German patents illustrating the principles and methods employed. These are classified as follows: (1) carbonization of wood (22 patents); (2) treatment of peat and coal (22 patents); (3) carbonization of miscellaneous raw materials (20 patents); (4) various methods of prepn.

and regeneration (20 patents); (5) filtration carbons (21 patents); (6) app. patents (13 patents). W. C. Ebaugh

Activated silica gel (Sulfosil). B. Tuichinin and V. Tokmanov. *Neftyanoye Khozyaistvo.* **12,** 414–5(1927); *Chem. Zentr.* **1927,** II, 1524–5.—Preliminary communication. Silica gel satd. with H_2SO_4 or fuming H_2SO_4 is suggested for treating mineral oils and similar products, to replace the old method in which oils are treated with concd. H_2SO_4 or fuming H_2SO_4 and adsorbers. This gel (Sulfosil) is prepd. by drying it at 300° and mixing it gradually when still hot with H_2SO_4 heated to 200° to 250° or fuming acid at 50°. The silica gel is able to adsorb without being changed externally 2.4 parts of H_2SO_4 and 0.6 parts of SO_3. Gels were used mostly with 0.2 parts of SO_3. Sulfosil is hygroscopic and looses its activity when left in the air. A. A. Boehtlingk

Graphite. A. Dubosc. *Caoutchouc and gutta-percha* **25,** 14117–8(1928).—Data on the d., volatile matter, C and ash of numerous graphites are compiled. Cf *C. A.* **22,** 1217, 2641. C. C. Davis

Graphite. Benjamin L. Miller. *Mineral Ind.* **36,** 269–77(1927).—A statistical discussion of world sources and production. A. B.

The knowledge and literature of graphite. Ed. Donath. *Chem.-Ztg.* **52,** 589–90, 610–11, 650(1928).—A review of the graphite literature and of the work of D. and of A. Lang on graphite. The prepn. of pure graphite free of all accessory elements such as N, S, Fe and especially H is difficult. H detd. after heating the graphite to 800–830° is considered as accessory to the graphite proper, while the S is associated with the Fe rather than with the graphite itself; N can be detd. by the Kjeldahl method, with a mixt. of 30 cc. H_2SO_4, 18 g. K_2SO_4, 1 g. CuO and 1 g. HgO; the oxidation takes 3–7 days. In 28 diff. graphites analyzed the H content varied from 0.05 to 0.13%; total S minus ash S was 0.01–5.02%, N 0.021–0.182%. Acheson graphite, cast-iron graphite and blast-furnace graphite were the purest, the latter two contg. no S, H and N. Graphite, retort carbon and coke are oxidized by an alk. melt; the time of reaction is a function of the combustibility of each modification. Graphitic acid was prepd. from Acheson graphite, Ceylon, Russian, blast-furnace, Sibirian, Italian, Corean and cast-iron graphite; it varied in the above order for C from 56.27 to 51.31%, H 1.80–2.18%, O 41.43–46.51%. R. D. Bumbacher

Some substances analogous to graphite. II. Ricardo Ciusa. R. Univ. Bari. *Gazz. chim. ital.* **58,** 222–3(1928); cf. *C. A.* **20,** 736, 2870.—Dry hexahydrobenzene was heated *in vacuo* at 400° in a sealed tube, the product was then heated in a current of N_2 at 540°, 650° and 770° and the elec. resistance and d. of the 3 products and of Ceylon graphite were compared. The following data give the resistance (in ohms) and the d. of the 4 graphites: made at 540°, 245.63, 0.7; made at 650°, 7.05, 1.6; made at 770°; 0.15, 2.0; Ceylon graphite, 0.11, 2.25. The graphite made at 770° is very similar to natural graphite. C. C. Davis

Precious stones. George F. Kunz. *Mineral Ind.* **36,** 491–513(1927).—Diamonds, emeralds, opal, pearls, sapphires and other stones are discussed with reference to sources and production. A. B.

Commercial caseins. Marc Fouassier. *Bull. soc. hyg. aliment.* **16,** 218–29 (1928).—A brief discussion of the production and characteristics of industrial (rennet and lactic caseins) and alimentary caseins (acid casein). Expts. are described showing the survival of *B. subtilis, B. tyrothrix* and probably *B. tenuis* in milk which has been boiled. Their effects on milk are briefly discussed. The first part of the article is also in *Ann. fals.* **21,** 340–2(1928). A. Papineau-Couture

Properties and use of adhesives. J. Wetzler. *Kunstdünger Leim. Ind.* **34,** 332–3, 343–4; *Chem. Zentr.* **1927,** II, 2031.—A summary of the production, properties and use of *adhesives from egg and blood albumins.* They are distinguished by their waterproof quality and are indispensable for adhesive use where the object is exposed to warm, moist air. C. C. Davis

Chemical utilization of bones in Czechoslovakia. Ad. Šonka. *Chemický obzor* **1,** 359–62(1926); *Chem. Zentr.* **1927,** II, 1000.—The author summarizes the different ways in which bones are chemically utilized. They are the starting material for bone fat, glue and gelatin, spodumene and charcoal, fodder lime and bone meal. He mentions the quantities of energy required in this industry. G. Schwoch

Heat consumption of gas-fired lime kilns. H. Hälbig. *Arch. Wärmewirt.* **9,** 143–4(1928).—A good example of an installation with coal-fired producer used 1179 cal. per g. of lime produced. Another, with bad coal, used 1600 cal. One using brown coal used 1173; very wet brown coal cannot be used. A small exptl. unit showed that blast-furnace gas can be used—even for dolomite, if gas and air are preheated. Ernest W. Thiele

Rotary furnaces for pyrites burning. C. P. Debuch. *Papierfabr.* **25**, *Tech.-Wiss. Teil* 365–79(1927); cf. *C. A.* 22, 2910.—Constructive details in the adaptation of rotary furnaces for the burning of pyrites, with illustrations. J. L. Parsons

Testing liquid insecticides. C. H. Peet and A. G. Grady. Rohn and Haas Labs. *Soap* 4, 95–9, 113–5(1928). E. Scherubel

Studies on the toxicity of hydrocyanic acid. James B. Allison. Iowa State Coll. *Iowa State Coll. J. Sci.* 2, 243–52(1928).—The cockroach, rice weevil and albino rat were exposed to varying concns. of HCN derived from liquid HCN, from NaCN and from $Ca(CN)_2$. The data are presented in tables, in plane curves and in a solid figure. In the solid figure the axes represent time, concn. and % kill. The data do not indicate any difference chemically or in toxicity effect between the HCN from liquid HCN and NaCN and that generated from Calcyamid. M. ps. varying from 65° to 92° for different samples of Me Hg cyanide indicated the presence of isomers. The equation, toxicity = concn. × time, holds in only a limited range which may be different for different toxic agents, and different for different animals for the same toxic agent. F. E. Brown

Studies in insecticidal activity. I. Testing insecticides against flies. C. H. Peet and A. G. Grady. Rohn and Haas Co., Bristol, Pa. *J. Econ. Entomol.* **21**, 612–7(1921). **II. Direct contact sprays.** *Ibid* 617–20. **III. Testing insecticidal fumigants—*i. e.*, insecticides which function in the vapor phase.** *Ibid* 621–3. **IV. Testing insecticides as insect repellents and moth killers.** *Ibid* 624–5.—In making comparative tests of household insecticides which act on flies by volatilization or air float, variables should be reduced to a min. A definite standard of time, temp., humidity, insecticide concn., spray concn., spraying pressure, air condition, angle of spray, kind and condition of insect, should be adopted. Many tests and extended observations are necessary. Directions for conducting tests on flies are given. A standard method is described in detail for testing sprays which act upon the insect by direct contact. A math. formula which expresses the effectiveness is included. The method is adapted to the use of water-sol. compds., emulsions and solids in powder form. The cockroach (*Blatella germanica*) and the leather beetle (*Dermestes vulbinus*) have proved to be excellent test insects. A procedure is also given for testing fumigants for insects in storage warehouses, grain elevators, etc., and for testing insecticides and repellents against clothes moths. C. H. Richardson

Carbon disulfide in combating unhealthful vermin. Th. Saling. Landesanst. f. Wasser-, Boden- u. Lufthyg., Berlin-Dahlem. *Kl. Mitt. Ver. Wasserversorg. Abwässerbeseitig.* 2, 184–8(1926); *Chem. Zentr.* **1927**, II, 1734–5.—A serious warning is given against the use of CS_2 by evapn. to a gas. Far less dangerous is the combustion of CS_2 to which has been added 10% of equal parts of water and alc. C. C. Davis

Sulfur dioxide in combating unhealthful vermin. G. Kunike. Landesanst. f. Wasser-, Boden- u. Lufthyg., Berlin-Dahlem. *Kl. Mitt. Ver. Wasserversorg. Abwässerbeseitig.* 2, 192–4(1926); *Chem. Zentr.* **1927**, II, 1735.—The essential facts in connection with the combustion of S and S prepns. are discussed. C. C. Davis

Studies in breeding insects throughout the year for insecticidal tests. I. Houseflies (Musca domestic). A. G. Grady. Rhom and Haas Co., Bristol, Pa. *J. Econ. Entomol.* **21**, 598–604(1928). **II. Leather beetles (Dermestes vulpinus Fab.).** *Ibid* 604–8. **III. Roaches, clothes moths, weevils.** *Ibid* 608–12.—Largely biol. with data on the use of these insects in insecticidal expts. C. H. R.

Investigations of the control of the Khapra beetle (Trogoderma granarium, Everts) with calcium cyanide. H. W. Miles. Victoria Univ., Manchester, Eng. *Bull. Entomol. Research* **18**, 251–5(1928).—These beetles may be controlled in malt bins by dosages of Ca cyanide of 2 lb. per 1000 cu. ft. Several fumigations during a summer are necessary for the best results. C. H. Richardson

"Tetra" fire extinguishers and phosgene formation. J. Voigt. *Z. angew. Chem.* **41**, 501–2(1928).—Commenting upon an article by Glaser and Frisch (cf. *C. A.* **22**, 3742–3) V. shows that although $COCl_2$ formed from CCl_4 and air may run high under certain exptl. conditions, yet the fact that so few accidents have occurred from fire extinguishers contg. CCl_4 and other chlorides, although many thousands of them are in daily use, indicates that the danger from this source is not as great as is assumed sometimes. W. C. Ebaugh

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Flame speed of H_2S (Chamberlain, Clarke) **2.** Al and bauxite (Anon). **9.** Economic symposium on N (Haynes, *et al.*) **13.** Pb as a constructional material for chemical plant (Tungay) **9.** Catalytic reactions of gases (U. S. pat. 1,686,349) **13.**

Paint or waterproofing material (U. S. pat. 1,684,593) **26.** Catalytic oxidation (Fr. pat. 635,717) **13.**

Reactivating adsorbent substances. METALLBANK UND METALLURGISCHE GES. A.-G. Brit. 285,480, Feb. 18, 1927. The adsorption medium is charged with a "scavenging medium" before use; *e. g.*, C to be used for removing benzine vapor from gases is previously moistened with water and reactivation is effected by heating to generate steam from the water.

Purifying hydrogen, argon, etc. GENERAL ELECTRIC CO., LTD., and C. J. SMITHELLS. Brit. 284,808, Nov. 25, 1926. H or rare gases such as A alone or mixed with H are freed from water, O and other oxidizing impurities by passing over metallic Cr heated to 700–850° (suitably after a preliminary purification with Cu heated to redness and with P_2O_5). The use of hot W and Na is mentioned also.

Sulfuric acid. SOC. GÉNÉRALE METALLURGIQUE DE HOBOKEN. Brit. 284,208, Jan. 24, 1927. In making H_2SO_4 from cold sulfurous gases, the acid is denitrated by a stream of hot sulfurous gases in a tower preferably filled with pieces of inert material of irregular form and of an av. size of less than 40 mm.

Sulfuric acid. SOC. GÉN. METALLURGIQUE DE HOBOKEN. Fr. 635,506, June 3, 1927. Concd. H_2SO_4 is obtained in the chamber process by denitrating the acid with cold sulfurous gas and concg. the denitrated acid in a sep. app. placed between the denitrator and the roasting furnaces.

Hydrobromic acid. N. BOZHOVSKII AND P. T. DANILCHENKO. Russ. 3647, Sept. 30, 1927. A mixt. of Br vapor and steam is passed through red-hot carbon.

Condensation of phosphoric acid. COMPAGNIE NATIONALE DE MATIÈRES COLORANTES ET MANUFACTURES DE PRODUITS CHIMIQUES DU NORD REUNIES, ÉTABLISSEMENTS KUHLMANN. Fr. 635,765, June 10, 1927. H_3PO_4 in the form of a gas from the oxidation of P is condensed in a tower by a stream of H_3PO_4, at a temp. and concn. such that the resulting acid is at a required concn., and the incompletely extd. gas leaving the tower is at such a temp. that the steam therein will not condense. The residual H_3PO_4 is extd. with pumice stone, coke, porcelain, etc.

Apparatus for making hydrocyanic acid. M. A. GUSEV. Russ. 4319, Sept. 15, 1924.

Removing carbon dioxide from gases. I. G. FARBENIND. A.-G. Brit. 284,574, Oct. 24, 1927. In scrubbing gases such as those to be used for NH_3 synthesis, as described in Brit. 271,852 (*C. A.* **22**, 1637), aq. NH_3 is used as the scrubbing liquor in the first of a series of towers and gypsum liquors are used in the later towers. The gypsum liquors are obtained from the sediment formed in the prepn. of $(NH_4)_2SO_4$ from gypsum, NH_3 and CO_2, by suspending the sediment in water, filtering it through coke, and dilg. with water.

Acid and salts strongly absorbing ultra-violet rays. TSUNEO SUZUKI and SUEO SAKURAI (to Zaidan Hojin Rikagaku Kenkyujo). U. S. 1,684,562, Sept. 18. In prepg. a condensation product of sugar and a parasulfonic acid compd. of phenylhydrazine, an aq. soln. of an osazone-forming sugar such as grape sugar or invert sugar is heated with a *B*-sulfonic acid compd. of phenylhydrazine in quantity sufficient to form an osazone and with NaOAc until the soln. assumes a dark yellow color, and the condensation product is pptd. with alc. It may be used in *paints, pigments*, etc., which are opaque to ultra-violet rays.

Storing alkali metals or similar oxidizable material. DOROTHY H. BROPHY AND WILLIAM A. RUGGLES (to General Elec. Co.). U. S. 1,685,666, Sept. 25. The material is placed under oil, a capillary tube in a casing closed at its lower end is inserted through the oil and into the material (such as alkali metal), the lower end portion of the casing is removed, and the tube is filled with the metal or other material to retain it for storage.

Synthesis of ammonia. GEORG FRIEDRICH UHDE. Fr. 635,933, Apr. 28, 1927. The mixt. of N and H is heated to a moderate temp., 300–400°, before entering the reaction furnace, and transmits the heat to the furnace and contact materials.

Apparatus for ammonia synthesis. GEORGES CLAUDE (to Lazote Inc.). U. S. 1,686,799, Oct. 9. An outer pressure-sustaining vessel or tube is provided with a head or closure which carries a conduit for the gases; this conduit extends into the app. beyond the closure and carries on its inner extension an inner tube contg. the catalyst. Various structural details of the app. are described.

Apparatus for ammonia synthesis. GIACOMO FAUSER. U. S. 1,686,371, Oct. 2. A reaction chamber is surrounded by a pressure-resisting wall (spaced from the reaction chamber) and a heat-exchanger is located in the space between the reaction chamber and surrounding wall. This heat-exchanger is formed of tube sheets and tubes ex-

tending longitudinally of the reaction chamber, and the reaction chamber is surrounded with heat-insulating material, the thickness of which varies directly with the temp. gradient in the heat-exchanger.

Separation of ammonia from gases. GEORG FRIEDRICH UHDE. Fr. 635,932, June 13, 1927. NH_3 is sepd. from gases, particularly from N and H, by allowing liquid NH_3, obtained by a previous incomplete liquefaction, to vaporize and pass countercurrent to the gaseous mixt. to be treated, thereby cooling and freezing the NH_3 therein.

Alkali metal salts of organic compounds. KARL DOBMAIER (to I. G. Farbenind. A.-G.). U. S. 1,685,191, Sept. 25. Org. compds. such as chlorobenzoic acid or Hg derivs. are treated with PhONa, Na β-naphtholate or other suitable alkali metal salts of hydroxylated aromatic compds.

Salts from sea water. DEMETRIUS G. ZALOCOSTAS (to The Salt Production Syndicate Ltd.). U. S. 1,684,935, Sept. 18. Sea water is evapd. at a high temp. until a concn. is reached below that at which $CaSO_4$ is pptd., the concd. brine is transferred to another closed chamber, the heating surfaces of which are maintained at a temp. of about 38° and which is under sufficient vacuum to produce rapid evapn. at that temp. so that $CaSO_4$ is pptd. as a mud; the strong brine is then transferred to another evaporator and the evapn. is continued for the pptn. of NaCl and the residual liquor contg. the bitterns is finally removed.

Complex hydrofluoric salts. MAX BUCHNER (to Albert Meyerhofer). U. S. 1,685,628, Sept. 25. An alk. earth metal fluoride such as CaF_2 is treated with a fluoride of Si or B in the presence of a salt of an alkali metal such as NaCl, the complex hydrofluoric salt of which metal is to be produced.

Double carbonate of sodium and magnesium. HANS RUBINSTEIN. U. S. 1,684,-782, Sept. 18. $MgCO_3$ is treated, in the presence of an alkali metal chloride and while heated (suitably at a temp. of about 60–70°), with an excess of soda in soln.

Treating metallic oxides. ALUMINIUM COMPANY OF AMERICA. Fr. 32,581, Nov. 27, 1926. Addn. to 622,313. Impurities are eliminated from Al_2O_3 in the liquid state in the elec. furnace, and the remaining impurities in the hollow-blown globules of Al_2O_3 are removed by leaching with a reactive acid such as H_2SO_4 and washing.

Nitrites. EUGENE T. DRAKE (to Cudahy Packing Co.). U. S. 1,685,629, Sept. 25. To effect the bacteriological conversion of nitrates into nitrites, a series of cultures is formed of an aq. soln. of $NaNO_3$, sugar, NaCl and "amino-nitrogen" (such as a meat juice prepn.) with selected groups of non-putrefactive, non-pathogenic, nitrate-reducing, non-proteolytic, motil and non-motil, salt-tolerant bacilli capable of converting nitrates into nitrites and cultures so prepd. are used for treating nitrate.

Alumina. T. SUZUKI, H. TANAKA and T. KURITA. Brit. 284,661, Feb. 3, 1927. In order to obtain pure alumina from alumina contg. Si, Fe, ferro-Si or oxides of Fe, the material is treated with Cl or HCl gas at temps. above 200° and reducing agents such as C or CO also may be used. Various details are given.

Separating alumina from alum. GEORGE S. TILLEY. U. S. 1,686,112, Oct. 2. Crystd. K alum is heated to a temp. (suitably about 80–85°) substantially below that at which it would melt in its H_2O of crystn., the temp. is maintained for a sufficient time to remove over half of the H_2O of crystn., and the material is thereafter heated to a sufficiently higher temp. (suitably about 800–1000°) to drive off the SO_3 which is initially combined with the alumina. The material may then be leached to sep. the alumina as an insol residue. The SO_3 produced may be absorbed in strong H_2SO_4 to produce still stronger acid.

Separation of aluminum hydroxide from solutions of aluminates. B. G. VISHNEVSKII. Russ. 3985, Nov. 30, 1927. $Al(OH)_3$ is formed by the action of CO_2, SO_2 or H_2S or their alkali salts.

Synthetic ammonia. GEORGE F. UHDE. U. S. 1,685,734, Sept. 25. NH_3-forming gases are brought into contact with a catalyst comprising the dried reaction product of a complex alkali metal Fe cyanide compd. such as $K_4FeC_6N_6$ or $K_3FeC_6N_6$ with a hydrolyzable metal salt such as $AlCl_3$. Cf. *C. A.* **22**, 2035.

Ammonium chloride. IMPERIAL CHEMICAL INDUSTRIES LIMITED. Fr. 635,626, June 8, 1927. NH_4Cl is prepd. from gaseous NH_3 and HCl in the presence of H, the residual H_2 being used for the synthesis of NH_3 or HCl, making a cyclic process. Cf. following abstract.

Crystals of ammonium chloride. IMPERIAL CHEMICAL INDUSTRIES. Fr. 635,627, June 8, 1927. NH_4Cl is obtained in crystal form by the reaction of gaseous NH_3 and HCl, dild. with H, at sufficient speed, and in heat-insulated chambers to obtain a high reaction temp. Cf. *C. A.* **22**, 3497 and preceding abstract.

Barium ortho- or trisilicate. RHENANIA-KUNHEIM VEREIN CHEMISCHER FABRIKEN

A.-G. Fr. 636,045, June 16, 1927. Ba ortho- or trisilicate is prepd. by heating $BaCO_3$ with silicic acid or Ba metasilicate in the presence of steam, thereby lowering the temp. necessary. The steam may be led in with the furnace gas, or a gas contg. sufficient H to form the necessary steam may be added.

Calcium cyanamide. JOSEPH RAITZYNE. Fr. 32,584, Nov. 29, 1926. Addn. to 628,303. The action of NH_3 on $CaCO_3$ is carried out in the presence of small quantities of metals such as Fe or oxides which increase the formation of $Ca(CN)_2$.

Calcium polysulfide. CHARLES D. WOOD (to Los Angeles Chemical Co.). U. S. 1,685,895, Oct. 2. S is ground in the presence of lime and hot water.

Magnesia. STEIRISCHE MAGNESIT INDUSTRIE. Austrian 109,012, April 15, 1924. Magnesite is heated to 500–600°, at which temp. $MgCO_3$ is decomposed but $CaCO_3$ remains unchanged. MgO is then sepd. by taking advantage of its great friability, the calcined product being gently triturated so that substantially only the MgO is pulverized.

Potash salts from wyomingite, etc. ROBERT D. PIKE and ROSS CUMMINGS (Cummings' interest to Pike). U. S. 1,686,835, Oct. 9. A fine ground pulp of mineral such as wyomingite is treated under heat and pressure with a soln. of NaCl contg. a small proportion of $NaHCO_3$.

Potassium chlorate and chloride. E. I. SHPITALSKII and Z. A. IOFFE. Russ. 4354, Jan. 31, 1928. Cl_2 acts on such a concn. of K_2CO_3 as to ppt. out finally the KCl at an elevated temp. in a solid form. To convert the K_2CO_3 into $KClO_3$ without any side reaction, such as the decompn. of KClO into KCl and O_2, the first stage of the reaction of satg. K_2CO_3 with Cl_2 in which bicarbonate is formed and the highest concn. of hypochlorite is reached is carried out at a moderate flow of Cl_2 and at low temp. In the second stage, to obtain an acid soln. which favors the transformation of KClO into $KClO_3$ the temp. of the soln. is gradually raised and excess of Cl_2 is admitted.

Sodium bicarbonate and ammonium chloride. BERNHARD LOPMANN. Can. 283,687, Oct. 2, 1928. First NH_3 and CO_2 and thereafter NaCl are made to act on a soln. contg. besides the bicarbonate and chlorides of Na and NH_4, a readily sol. auxiliary salt of one of the two bases and of an acid other than HCl and CO_2; NH_3 is introduced into the soln. during pptn. of the NH_4Cl; the pptd. solids are sepd. from the liquor by filtration; and the filtrate is treated with CO_2 to convert the $(NH_4)_2CO_3$ formed in the soln. into NH_4HCO_3.

Sodium sulfide. B. LAPORTE, LTD. (M. Schlaugk Ges.). Brit. 284,958, Sept. 21, 1927. Solns. of Na sulfide are freed from Fe by treatment with a cyanide, *e. g.*, by heating to 85–90° with 0.2–1.0% NaCN. Colorless crystals may be obtained from the purified soln.

Tungsten oxide gel. WALTER A. PATRICK and EARLE H. BARCLAY (to Silica Gel Corp.). U. S. 1,683,695, Sept. 11. An acid such as HCl or H_2SO_4 is added to a soln. of Na tungstate or other suitable tungstate in such proportion that the final acidity after reaction will be 0.1–0.5 *N* the addn. of acid is stopped on the appearance of a ppt. until the ppt. redissolves on stirring, and more acid may then be added; the sol is allowed to set to a hydrogel, and is washed and partially dehydrated. Cf. *C. A.* **22**, 3965.

Zinc carbonate. N. A. LAURY. Brit. 285,260, March 7, 1927. Roasted Zn ore is heated to about 80° in a 20% aq. $(NH_4)_2SO_4$ soln., the clear soln. is sepd., cooled and satd. with CO_2 under a pressure of 20 lbs. per sq. in. Cf. *C. A.* **21**, 3429.

Calcining alkaline earth carbonates. REED W. HYDE (to Dwight & Lloyd Metallurgical Co.). U. S. 1,684,958, Sept. 18. Small particles of carbonate such as limestone, dolomite or magnesite are mixed with a small proportion of solid fuel, *e. g.*, coal, and the mixt. is spread in a layer of uniform thickness and permeability, and independently heated gases are passed through the layer to burn out the solid fuel and rapidly heat the carbonate to a temp. below the incipient fusion point and above the decompn. temp. to convert the carbonate to oxide. An app. is described. Cf. *C. A.* **22**, 1454.

Hydrogen. MME. CASALE (Née MARIA SACCHI). Fr. 635,946, June 14, 1927. A mixt. of O and CO_2 is passed over incandescent charcoal, and the CO formed is purified and led with steam over catalysts to produce H and CO_2. The O may be mixed with N to obtain a final mixt. of N and H for the production of NH_3. Cf. *C. A.* **22**, 3497.

Hydrogen. J. BELLAY. Brit. 284,262, Jan. 26, 1927. See Can. 282,952 (*C. A.* **22**, 4213).

Hydrogen by dissociation of hydrocarbons. RUDOLF BATTIG. Fr. 635,670, May 18, 1927. In the decompn. of hydrocarbons, particularly CH_4 for the production of H, the gas passes through a preheating chamber, through a chamber where it is heated to dissocn. temp., and then through a chamber where the C is continuously extd. by coke

or Fe. The H passes on to a chamber where its heat is absorbed. Air is then passed in the reverse direction to burn the C deposit and reheat the first chamber.

Phosphorus. I. G. FARBENIND. A.-G. Brit. 285,055, Feb. 10, 1927. Raw phosphates, C and material contg. SiO_2 and Al_2O_3 are heated together in such regulated proportions as to produce P and H_3PO_4 and a slag having a compn. similar to blast-furnace slag and suitable for the production of *slag cement, e. g.*, by grinding with portland cement clinker.

Oxidation of phosphorus. COMPAGNIE NATIONALE DE MATIÈRES COLORANTES ET MANUFACTURES DE PRODUITS CHIMIQUES DU NORD RÉUNIES, ÉTABLISSEMENTS KUHLMANN. Fr. 635,501, June 3, 1927. Phosphides, particularly phosphides of Cu or Ni, are used as catalysts for the oxidation of P in the presence of steam. The phosphides are prepd. by the action of H_3P on solns. of metallic salts distributed on suitable supports, such as calcined bone, coke, porous blocks of SiC, Fe-Si, Ni-Cr or silicophosphides of Fe.

Oxy-compound of phosphorus. CLAUDE G. MINER (to Phosphorus Hydrogen Co.). U. S. 1,686,873, Oct. 9. Reaction of H_2O on P is effected in the presence of an alkali metal such as K which is intermixed with the P in the form of a condensate and serves to facilitate the reaction

Sulfur and calcium sulfide. ALBERT GALLETTI. Ital. 251,496, Feb. 12, 1926. Process for working minerals with SO_2 to obtain S and Ca sulfite. Addn. to Ital. 241,099, June 27, 1925.

Sulfur. AUGUSTO DELL'AMORE. Ital. 246,312, Feb. 18, 1926. Economical process for heating fusion ovens for S minerals at a low temp. A special oven is specified.

Sulfur. VINCENZO MORANI and ROBERTO VERDERAME. Ital. 248,955, May 19, 1926. Process for the combustion of minerals in the S pits with successive transformation of combustion compds.

Sulfur. VISCOSA SNIA and GIUSEPPE GUADAGNI. Ital. 245,595, Jan. 12, 1926. Oven with heat recovery for complete extn. of S from minerals.

Sulfur recovery from furnace gases. WM. H. HOWARD. U. S. 1,685,231, Sept. 25. Furnace gases contg. SO_2 are passed in contact with a body of water to form a soln. of SO_2; a current of air is utilized to take up the SO_2 from the water and the mixt. of air and SO_2 is subjected to the action of incandescent carbonaceous material to form elemental S.

Concentration of highly diluted iodine solutions. O. YU. MAGIDSON. Russ. 4561, Sept. 15, 1924. Weak solns of I treated by one of the known methods to sep. I in the form of the element are passed through a starch suspension until it is satd. The I absorbed is then extd. from the starch by a soln. of Na_2SO_3 or other reagents which change the I into HI or its water-sol. salts.

Active carbon. VEREIN FÜR CHEMISCHE UND METALLURGISCHE PRODUKTION. Brit. 285,386, Feb. 14, 1927. The acidity of C which has been activated by use of acid substances or those which develop acidity is removed by treatment under pressure with milk of lime, Na_2CO_3, NaOH or other alk. substance at temps. of 100–150°.

Activated carbon. SOCIÉTÉ ANON. DES ENGRAIS ET NOIR ANIMAL. Fr. 635,832, Oct. 6, 1926. Activated charcoal of high density is obtained by treating the carbonaceous material with a small proportion of HNO_3 during charring.

Activated charcoal. RICHARD THRELFALL. Fr. 635,239, May 30, 1927. See Brit. 270,505 (*C. A.* **22**, 1658).

Apparatus for activation or revivification of carbon. STANLEY A. W. OKELL and LEONARD WICKENDEN (to Industrial Chemical Co.). U. S. 1,686,100, Oct. 2. A long shallow trough is provided with a longitudinal series of rakes which oscillate longitudinally to and fro and gradually propel the charge from rake to rake through the trough, while it is electrically heated.

Electrodes and other articles formed of carbon. I. SZARVASY. Brit. 284,818, Dec. 6, 1926. See U. S. 1,675,674 (*C. A.* **22**, 3101).

Furnace (with superposed hearths and stirring devices) for revivifying decolorizing carbon, etc. JOSEPH H. HOLT (to Darco Corp.). U. S. 1,685,745, Sept. 25.

Mica. VASSALLO ALDO and GRONDONA PETRO. Ital. 245,456, January 9, 1926. A recovery process.

Borax from rasorite. THOMAS M. CRAMER (to Pacific Coast Borax Co.). U. S. 1,685,214, Sept. 25. The material is treated with water or a mother liquor at a temp. substantially above 100°. Live steam also may be used. Cf. *C. A.* **22**, 3497.

Reaction tower and heat-exchange device for causticizing sodium carbonate while bubbling hot gas such as air and steam through the materials. WILLIAM D. MOUNT. U. S. 1,685,929, Oct. 2.

Fuller's earth and other adsorbents. R. R. ROSENBAUM. Brit. 284,327, Jan. 29, 1927. Fuller's earth or other adsorbent is activated or regenerated by treatment with liquid SO_2, preferably in the filter used for purification of hydrocarbons, oils, waxes, etc. (and suitably after preliminary treatment with steam to remove most of the adsorbed oil, etc.). An app. is described.

Adsorption agent containing carbon. OSKAR SCHOBER. Fr. 635,781, June 10, 1927. A carbonaceous material rich in ash or substances capable of producing ash is treated at activation temp. with oxidizing agents, gases or vapors till the final product contains at least 20% of ashes sol. in HCl.

Adsorbents from zeolitic material. A. ROSENHEIM. Brit. 284,245, Jan. 25, 1927. The process of treating zeolitic material with acids or acid salts for the production of adsorbents as described in Brit. 275,203 (*C. A.* **22**, 2248) is carried out by adding the acid or acid salt gradually or intermittently to a suspension of the material in water, preferably with heating, so that solid non-gelatinous products are obtained. The zeolitic material may be preliminarily heated to 300–800° and the product of the treatment may be formed into briquets with a binder such as waterglass or resin which may, if desired, be subsequently removed. Examples and details are given.

Removing incrustations formed from milk on hot metallic surfaces. R. SELIGMAN. Brit. 284,778, Nov. 4, 1926. The surfaces are treated with an acid contg. casein or gelatin, *e. g.*, an aq. soln. contg. H_3PO_4 2 and casein 1% at 85–100° which may be circulated over the metal surface to be cleaned. The casein or gelatin serves to minimize or prevent action of the acid on the metal itself.

Phosphatides. PHARMAGANS PHARMACEUTISCHES INSTITUT L. W. GANS A.-G. Brit. 285,417, Feb. 16, 1927. Lipoids such as phosphatides are extd. from materials contg. them by dialysis without destruction of the cellular structure; *e. g.*, peas and beans may be treated with water or dil. alc. at a temp. not exceeding 37°. The phosphatides are removed from the dialyzing liquid by adding fat-dissolving substances such as alc. or acetone, which cause pptn. of the phosphatide. Adsorbents also may be used to effect the sepn. The dialysis may be accelerated by the use of a difference of elec. potential of a "few hundred volts" between electrodes in an app. which is described. Various modifications and details of the process are given.

Albumins. HENRI BEAUFOUR. Fr. 32,707, July 2, 1926. Addn. to 617,280. Sea water is used to dissolve the albumins contained in plants or parts of plants. A treatment with lime or other alk. earth hydroxide may precede or follow the treatment with sea water. Cf. *C. A.* **21**, 3433.

Water-soluble "silicate-albumins." J. A. VON WULFING and A. BUSCH. Brit. 284,450, Jan. 11, 1927. Alkali metal polysilicates are combined with casein or albumin substances of acid character, such as nucleoalbumins or albuminates, and an alkali such as NaOH, to obtain neutral or weakly acid water-sol. metasilicate albumin prepns.

Softening and waterproofing formolized casein and cellulose products. GASPARD JAKOVA-MERTURI and JOSEPH-ALFRED POGGIOLI. Fr. 635,637, June 8, 1927. Products having a basis of formolized casein or cellulose such as cellulose acetate or celluloid are treated in the warm in a bath of KOCl and (or) NaOCl and KOH, this treatment being followed by an immersion in a bath of mineral or vegetable oil contg rosin and S.

Metal glutins. KARL KÜTTEL (one-fourth each to Ernst J. Watzl and Herman J. Trenkamp). U. S. 1,686,281, Oct. 2. Metal glutins which can be used as substitutes for casein or bakelite in making various articles are prepd. by treating a soln. of glutin (suitably a 20% aq. soln. of glutin derived from animal wastes contg. ossein) with only such a quantity of an alkali such as NaOH as is required to transform all of the glutin into satd. alkali metal glutin, and then treating the latter with a suitable metal salt such as $Al_2(SO_4)_3$ or $ZnSO_4$ (suitably at a temp. of about 28°). The products are ductile while warm and become set and retain their shape when cool.

Machine bearings formed in part of bakelized wood. MANUFACTURE DE MACHINES AUXILIARES POUR L'ELECTRICITE ET L'INDUSTRIE. Brit. 284,654, Feb. 2, 1927. Structural features.

Urea-formaldehyde condensation products. KURT RIPPER (to Fritz Pollak). U. S. 1,687,312, Oct. 9. Water-sol. initial products are formed in 2 stages by adjusting the C_H in the first stage, which is completed after heating for a short time, to a value not exceeding about 10^{-7} and in the second stage to a value above 10^{-7} but below 10^{-3} and then the reaction is continued by further heating.

Composite molded articles such as caster wheels formed in part of phenolic condensation product and in part of rubber. LE BONSIEUR. U. S. 1,686,142, Oct. 2. Structural features.

Meltable adhesive. ERSKINE D. LORD (to McLaurin-Jones Co.). U. S. 1,684,873,

Sept. 18. A meltable waterproof adhesive suitable for use on paper or cloth sealing strips is formed of a fatty acid pitch and a smaller quantity of wax, *e. g.*, stearin pitch and paraffin with or without asphalt.

Plastic condensation products. SOC. ANON POUR L'IND. CHIM. À BÂLE. Brit. 284,589, Jan. 29, 1927. Condensation products from aniline and CH_2O or the like, formed in the presence of an acid such as HCl, are treated, at any stage of their production, with NaOH soln. or other suitable agent to eliminate the acid and produce a homogeneous, easily worked product which can be dried and compressed in molds while comminuted (suitably at 150° under 160 atm. pressure for 1.5 hrs.).

Dehydration of plastic condensation products of phenols and aldehydes. G. S. PETROV. Russ. 4328, Jan. 31, 1928. The products are heated at 100–180° in drying or semi-drying oils at ordinary or reduced pressure.

Plastic preparation. A. I. IEVLEV. Russ. 3429, Aug. 31, 1927. Crude wood pulp and paper mass after wet grinding and pressing off the water is ground with a drying oil and powdered chalk and mixed with a mass obtained by adding asphalt or resin or pitch or S to lime during the process of hydration. Na silicate soln. is added finally to this mixt.

Plastic preparation from peat. S. I. KISLITZUIN. Russ. 3713, Sept. 15, 1924. Any borate, *e. g.*, borax, is added to peat while still wet but sepd. from the aq. soln. after treatment with an aq. soln. of an aluminate.

Plastic compositions. JAROSLAW'S ERSTE GLIMMERWAREN-FABRIK. Fr. 635,745, June 10, 1927. See Brit. 272,947 (*C. A.* **22**, 1832).

Drying metallic powders. RINGSDORFF-WERKE A.-G. Fr. 635,511, June 3, 1927. To avoid oxidation in drying metallic powders, the water is replaced by an alc. or other volatile solvent which will replace water. A centrifuge may be employed.

Coating metallic surfaces. AMI REY. Fr. 635,306, May 23, 1927. Substances rich in C are distd. and the gaseous products are deposited on metallic surfaces forming a protective layer. The surfaces are afterwards dipped in a heated bath of adhesives, such as asphalt or tar.

Metallizing non-metallic surfaces. A. I. G. WARREN and PRECIOUS METAL INDUSTRIES, LTD. Brit. 284,786, Nov. 5, 1926. Surfaces such as those of wood, bone, ivory, phenol CH_2O condensation products, celluloid or vulcanized fiber (after a preliminary treatment with HOAc or other agent to open their pores if desired) are treated with an easily reducible metal compd. such as oxide or sulfide of Ag or Au (which may be formed into a fluid mixt. or thin paste with liquids such as $CHCl_3$, oil of turpentine, C_6H_6 or water) and the compd. is then reduced by use of steam under pressure or other suitable means. Some materials may be preliminarily treated with S or CS_2. Cf. *C. A.* **22**, 3129.

Contact oxidation of methane or gas mixtures containing methane. S. S. MEDVEDEV. Russ. 3605, Sept. 30, 1927. The gas or gas mixt. and O or O-contg. gases are heated in the presence of catalysts, heat-resistant at the reaction temp., such as tin borates, tin phosphates or other tin compds.

Impervious chemically resistant material. WARREN F. BLEECKER. U. S. 1,686,-197, Oct. 2. A material suitable for pipe linings, etc., is formed of artificial graphite, S, and solid hydrocarbons such as pitch.

Coating flues, etc., to render them impermeable to flowing gases. P. E. J. J. COURTURAUD (to Laboratoire de perfectionnements thermiques). Brit. 284,219, Jan. 24, 1927. Either the interior or exterior (or both) of flues or conduits (or the bricks from which they are made) are coated with Na silicate soln. or other sol. silicate soln., which may also be mixed with graphite.

Waterproof packing cloth. COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 635,537, June 4, 1927. Linen or other cloth is impregnated and covered with a mixt. of soft and adhesive pitch, *e. g.*, calking pitch and a non-drying oil to prevent hardening of the pitch. The cloth may be given a layer of sawdust.

Wetting agents. FARB- UND GERBSTOFFWERKE G. FLESCH (to H. Flesch). Brit. 284,249, Jan. 26, 1927. Highly sulfonated oils such as the sulfuric esters of dihydroxystearic acids having a content of 6% or over of "organically combined sulfuric acids" may be added to various solns. and emulsions such as those used in the *textile industry* to improve their wetting and penetrative capacity and cleansing properties. Various examples are given.

Friction material for brakes, clutches, etc. KIRCHBACH'SCHE WERKE KIRCHBACH & CO. Brit. 284,268, Jan. 26, 1927. Structural details are given of asbestos impregnated with bakelite or similar impregnated fibrous material assocd. with metal rings

or the like on which driving teeth may be formed. Brit. 284,269 specifies treating a mixt. such as fibrous material and bakelite, without heating, under very high pressure (suitably 5 tons per sq. cm.) and subsequently baking (suitably for several hrs. at 150–200° after preliminary drying at normal temp. for 14 days or longer). An app. is described. Cf. *C. A.* **22**, 1832.

Machine bearings of asbestos or other fibrous material impregnated with an artificial resin. Kirchbach'sche Werke Kirchbach & Co. Brit. 285,078, Feb. 12, 1927. Graphite or metal such as fine brass wires may be assocd. with the fibrous material.

Self-lubricating bearing. Joseph Brincil. U. S. 1,686,951, Oct. 9. The surface of a metal bearing which may be formed of bronze is abraded and then provided with a spongy layer of graphite and powd. bearing metal united (by use of shellac and pressure) to the abraded metal base.

Oil composition for use in hydraulic brake systems of automobiles, etc. E. D. Evans and C. C. Wakefield & Co., Ltd. Brit. 285,144, Nov. 10, 1926. A compn. which is substantially inert to rubber comprises castor oil and a miscible alc., higher than EtOH, such as cyclohexanol or Bu, Am or benzyl alcs.

Packing for gaskets, rods, etc. Burnie L. Benbow. U. S. 1,686,063, Oct. 2. A "base material" such as flax, asbestos or metal wool is immersed in a liquid bath contg. deflocculated graphite in suspension, then removed and the liquid evapd. to leave a dry adherent graphite coating on the material.

Electrically heated kiln suitable for burning limestone. Gottlieb Keller (to A.-G. Brown, Boveri & Cie.). U. S. 1,687,025, Oct. 9.

Freezing-point depressant suitable for use with water in automobile engine cooling systems. Samuel Isermann and Waldemar Vernet. U. S. 1,687,094, Oct. 9. Glycerol is used together with a sol. amide such as formamide which serves to lower the viscosity of the soln. at low temps.

Preventing adherence of soot to heated surfaces. P. E. J. J. Courturaud (to Laboratoire de perfectionnements thermiques). Brit. 284,218, Jan. 24, 1927. Graphite (which may be mixed with silicate of Na or K) is used for coating heated surfaces of boilers, superheaters, air heaters, retorts, etc., to prevent adherence of soot.

Bituminous linings or coatings for pipes or other metal articles. R. Illemann. Brit. 285,179, Nov. 22, 1926. The required plasticity of bituminous material is obtained by mixing it with a suspension of stone flour in water. Fibrous material also may be added and the product may be prepd. hot and used when either hot or cold.

Composition for filling cracks between wall board sheets, etc. Daniel C. Bruce. U. S. 1,685,981, Oct. 2. A "soap jelly" is mixed with a starch dextrin paste contg. borax, glycerol and oil of cloves and with comminuted fibrous material such as shredded wall board.

Hectographic compound. N. S. Odoyevtzev. Russ. 3959, Sept. 15, 1924. Fat clay is mixed with glycerol and a satd. soln. of $ZnCl_2$ until it reaches the consistency of putty.

Detergents. British Dyestuffs Corp., Ltd., J. Baddiley and E. Chapman. Brit. 284,367, Sept. 21, 1926. An abrasive such as whiting or pumice powder is used together with a sulfonic acid (or its sol. salt) of an aromatic hydrocarbon with a side chain of 2 or more C atoms or obtained by sulfonating mineral-oil fractions of high b. p. or by sulfonating mineral-oil fractions and condensing the product with an alc. Soap or solvents, etc., may be added. The mixt. is suitable for cleaning tiles, walls, stoneware, glass, metals and painted or polished surfaces.

Composition for cleaning silver. Robert B. Hoffman. U. S. 1,685,360, Sept. 25. Diatomaceous earth 100, water 150, $CaCl_2$ 6, Fe_2O_3 1, "ammonia" 1 and oil of citronella 1 part.

Dyeing and polishing pearl chips. George H. Gebhardt. U. S. 1,685,451, Sept. 25. Pearl chips are polished and then subjected to the action of a liquid dye such as an aq. soln. of an aniline dye in the presence of a substance, *e. g.*, H_2O_2, which tends to open the pores of the pearl chips, again polished after dyeing, and treated with a substance such as hot dil. HCl soln. to fix the dye and render the polish more permanent.

Decolorizing agents. Büttner-Werke A.-G. and Friedrich Kleinmann. Fr. 635,916, June 13, 1927. A decolorizing agent for sugar, etc., consists in a very intimate mixt. of hydrosilicates, such as fuller's earth, and active C from the incomplete combustion of colophony, pitch, tar oil, acetylene, gasoline, etc. The mixt. is obtained by wet grinding in such a way that the particles of C and fuller's earth do not sep. in use. Binding agents such as SiO_2 gel may be added.

Stencil sheets. J. Ehrlich. Brit. 284,907, May 13, 1927. Yoshino paper or the like is coated with a colloidal and plastic compn. over which a coating of the spores of *Lycopodium clavatum* is applied to preserve the plasticity of the coating and protect it from moisture. The first coating may comprise gelatin, glycerol and soap, oil or wax or rubber or the like mixed with tempering agents such as cellulose esters.

Sterilizing vegetable bristles or fibers. G. Averseng. Brit. 284,421, Nov. 10, 1926. The material is immersed in water and then in an antiseptic or anti-cryptogamic bath such as $ZnSO_4$, $CuSO_4$ or salicylic acid. The 2 stages of the treatment may be combined by use of a single boiling bath of the antiseptic.

Transfers. H. S. Sadtler. Brit. 284,676, Feb. 3, 1927. A non-absorbent paper is printed with a paste or ink and the surface dusted with a mucilaginous powder such as gum tragacanth which serves to dry the ink and facilitate penetration of the dye from the ink into the wetted fabric or other material in transferring. Mordants such as tannin or metal salts may be added to the ink which preferably contains a water-sol. dye which can be rendered fast by steaming. Cf. *C. A.* **22**, 875.

Sound record films of steel, nickel or other magnetizable material. H. Küchenmeister. Brit. 285,054, Feb. 10, 1927.

Insecticide. N. N. Manotzkova. Russ. 4298, Dec. 31, 1927. A mixt. of naphthalene, camphor, eucalyptus oil, NH_3 soln., NaCl, PhOH, denatured alc. and turpentine with the addn. of thuja oil and sap from the cactus is specified.

Fire-extinguishing composition. G. E. Lyutkevich. Russ. 4109, Nov. 30, 1927. Mustard is added as a foaming agent to the usual ingredients such as soda and NH_4Cl.

19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON, C. H. KERR

Improvements in the glass industry. Arendt. *Sprechsaal* **61**, 201–3(1928).—A general discussion on the German glass industry, number of persons employed, furnaces and types, temps., output per person of different types of ware and how automatic machinery is gradually replacing human labor. R. A. Heindl

Physical properties of glass and their control. Bernard Long. *Rev. sci.* **66**, 370–8(1928).—A review of the properties of different glasses, the methods and app. used in their testing and the factors affecting these properties. P. Thomasset

Changes in the properties of optical glasses. Paul Nicolardot. *Rev. gén. colloïdes* **5**, 445–9, 539–43, 592–8(1927); cf. *C. A.* **20**, 2729; **21**, 4037.—The changes occurring in optical glasses may be profound, as those caused in the interior of the glass by rays of short wave length. The effect of temp. (cooling and annealing) upon the properties of such glasses is well known. Superficial effects may also occur as, *e. g.*, those due to adsorption of gases and liquids on the surface of the glass. The gravest and most frequent superficial changes are described, as well as the diverse methods for detg. which glasses will be most resistant to each type of change. A detailed description is given of the app. and methods for detg. the diminution in the transparency of glass due to adsorption on its surface. A table is included in which the compn. of the various glasses is related to phys. and chem. properties. L. B. Miller

Recent improvements in the manufacture of flat glass. H. K. Hitchcock, *et al.* *Mech. Eng.* **50**, 778–80(1928).—Discussion (cf. *C. A.* **22**, 2249, 4215). E. J. C.

Strained glass. P. Lazarev. Inst. des Silicates de Moscou. *Chimie et industrie* Special No., 441–3(April, 1928).—Rapid cooling of SiO_2 glass to put it in a strained condition increases the hardness and the resistance to mech. action and lowers the d. and the sp. heat. The same effect was observed with borax glass. Under polarized light strained glass is double refracting and exhibits parallel interference surfaces which vary with the form of the piece of glass and which are closer and more numerous near the surface than towards the center. When borax glass is heated to the softening pt. and cooled slowly (annealed) crystals are formed both at the surface and in the interior of the glass. When such a glass is treated with H_2O, soln. does not take place uniformly over the whole surface but gives characteristic corrosion figures at various points: at the pts. where there are crystals the corrosion figures formed are regular, while at the pts. where there are no crystals the forms are curved and less regular. Investigation of strained glass by Laue's method showed it has no cryst. structure. A. P.-C.

Ampoule glass and p_H. Giovanni Issoglio. *Giorn. farm. chim.* **76**, 363–6

(1927).—The ampoules are autoclaved 2 hrs. at 110° with distd. water and compared with Na_2HPO_4-KH_2PO_4 solns. of p_H 7–8.2 with phenol red and bromothymol blue as indicators. MARY JACOBSEN

Classification of neutral glasses. E. BARONI. *Giorn. farm. chim.* 76, 66–71, 93–8 (1927); cf. *C. A.* 20, 975, 1689.—Tirelli's objection that for glasses contg. B hematoxylin (I) is less sensitive than phenolphthalein (II) is immaterial for practical purposes: I is decolorized only by 1% $Na_2B_4O_7$ but indicates it distinctly in concns. of 0.9–0.0005%. On the other hand glasses contg. much more borax than is practically workable (10–25%) gave after autoclaving with water at 134° an immediate and distinct I reaction. Even alk. glasses with the normal B content do not yield more than 186 mg. water-sol. ext., which is far below the inactivating B quantity. Moreover, I always permits the detection of inferior glass. *Ampoules* ought to be tested as follows: Test for acid (formed by decompn. of CaF_2 on fusing) with methyl red at room temp. or after slight heating with water. Autoclave 1 hr. with II at 134° (2 atm.). Sensitiveness: 0.005 mg. NaOH/cc. Glasses with a negative II test are sufficient for most purposes. Autoclave with bromothymol blue: sensitiveness 0.0004 mg. NaOH/cc. Autoclave with water and test with I. Use for all purposes only twice distd. deaerated water. Prepn. of the *indicators:* triturate 0.05 g. *methyl red* in a neutral glass tube with 15 cc. 0.1 *N* NaOH, add 2 drops abs. alc., shake and heat moderately on the water bath until soln. is complete. Dissolve in 100 cc. water, stir, filter and dil. 10 cc. to 400 cc. To 100 cc. water add 1.5–2 cc. of 1% II, immediately before use. In a test tube mix 50 mg. *bromothymol blue* and 5 cc. 0.01 *N* NaOH thoroughly, stir until the reaction is complete, decant, dissolve the residue in 5 cc. pure alc. and add to the combined solns. 90 cc. water. Dil. 20 cc. to 500 cc. I is prepd. in a 0 1% alc. soln. from C. P. crystals. M. J.

The soluble substance yielded by neutral glass in relation to its action on solutions for injection. EDUARDO BARONI. *Giorn. farm. chim.* 77, 223–38(1928); cf. preceding abstr.—Glass of better quality yields on autoclaving up to 0.007–0.008 mg. per ampoule of an inner surface area of 580 sq. mm. The results are always referred to 1-cc. ampoules. For the bromothymol blue test the indicator solns. are acidulated with 2.5, 5, 6, 7, 8, 10, 11, 12 cc. 0.001 *N* HCl/100 cc. Two good glasses *Fiolax* and *Tenax* were autoclaved 1–6 hrs. at temps. from 100 to 134°. Fiolax yielded to the water 0.0008 mg. in 1 hr. at 100° and 0.004 mg. after 1 hr. at 134° or 6 hrs. at 100°. The increases of soly. with temp. and time are irregular. Tenax yielded 0.0006 mg. after 1 hr. at 100°, 0.0028 after 6 hrs. at 100°, 0.0015–0.002 after 1 hr. at 128–34°. The diagram shows parallel unbroken straight lines. That this difference is entirely attributable to the difference in the compn. of the original glass is doubtful for the following reasons. Considerable differences were found for ampoules of the same lot. Expts. showed also that the sol. alkali content of a length of glass tube and of test tubes made from this tube by sealing one end was uniform throughout the entire length. Ampoules, however, made from this tube showed a different alkali content at different heights. It was markedly increased in the drawn out part. Those annealed in the flame had a considerably higher sol. alkali content than normal ampoules (0.005 in Tenax and 0.006 in Fiolax instead of 0.002 and 0.004). Glasses of poor quality suffer a more marked decompn. by heat. MARY JACOBSEN

Important qualities of several glasses used for chemical purposes. O. KALLAUNER AND JOSEF MATĚJKA *Chemicky Obzor* 2, 8–11; *Chem. Zentr.* 1927, II, 969.—The authors examd. several com. brands of chem. app. glass, as Jena glass, Eserco, Kavalier "Palex," Kavalier "S," and Resista. They report shape, surface and appearance of the glass material; measurements, vol. and density of the glass ware; resistance towards sudden change of temp. and towards impact; and the ability to resist the following: H_2O, 1% HCl, 20% HCl, concd. H_2SO_4, 5% NaOH and 5% NH_3. Tables are given for comparison. G. SCHWOCH

Annealing and leaching of chemical glassware. H. LÖBER. *Sprechsaal* 61, 160–2, 181–3(1928).—Glasses of 5 different hydrolytic classes were tested to det. the effect of a leaching soln. (Na_2O) on unannealed chem. glassware (flasks and test tubes) and after annealing one, two and three times. The classes of glassware tested include (1) water-resistant, (2) tough, (3) hard, (4) soft, (5) defective. Values and charts are given to show increased resistance to leaching with each additional annealing treatment. R. A. HEINDL

The viscosity of molten glass. P. LAZAREV. Inst. des Silicates de Moscou. *Chimie et industrie* Special No., 440(April, 1928); cf. *C. A.* 21, 3506.—The viscosity of viscous liquids was studied by 2 methods: (1) calcg. η by detg. the rate of fall of a metal sphere in the liquid, which is done by means of x-rays in the case of molten glass; (2) a cylinder filled with the liquid is rotated about its axis, a second cylinder is suspended

in the liquid by means of a fine metallic thread, and η is calcd. from the force acting on the suspended cylinder. The accuracy of these 2 methods is about 5%. A. P.-C.

Control and improvement of the composition of (glass) hollow ware. Oscar Knapp. *Glass Ind.* **9**, 165-8(1928).—A careful study of the effect of compn. upon the physical properties of glasses should precede any changes in batch compns. Triaxial diagrams for SiO_2, CaO, and Na_2O or $K_2O.Na_2O$ are advised which have double borders so that compn. and also a scale of properties can be included. The important characteristics which are linear functions of the compns. are tensile strength, endurance, expansion, elasticity, density and sp. heat. H. F. K.

The undissolved components of waste water and their determination in setting glasses. C. Zahn. Landesanst. f. Wasser-, Boden- u. Lufthyg., Berlin-Dahlem. *Kl. Mitt. Ver. Wasserversorg. Abwässerbeseitig.* **1**, 154-9(1925); *Chem. Zentr.* **1927**, II, 1745.—A description of methods and app. C. C. Davis

Tentative method for complete sand analysis. Glass Division, Standards Committee, Am. Ceramic Soc. *Glass Ind.* **8**, 217(1927). H. P. Hood

The influence of magnesium oxide on the resistance of glasses. M. A. Besborodow. *Keram. Rund.* **36**, 365-8(1928).—In a glass with the compn., SiO_2 67.91%, Al_2O_3 3.97, Fe_2O_3 0.03, CaO 9.00, B_2O_3 2.43, Na_2O 9.51, K_2O 7.06 MgO was substituted for CaO in increments of approx. 2% to a max. of 8.27%, the percentage amounts of the other oxides remaining approx. const. The resulting glasses, made up in the form of beakers of 400 cc. capacity, were tested by boiling for an hour with 2*N* NaOH soln. with 2*N* Na_2CO_3 soln. and with 20% HCl soln. After each treatment the loss in weight was detd. The results were as follows. (1) An increase in MgO and decrease in CaO decrease the resistance to NaOH soln. (2) Substitution of MgO for CaO increases the resistance to Na_2CO_3 soln. until a max. is reached at 5.78% MgO. Further increase in MgO causes a decrease in resistance. (3) Substitution of MgO for CaO decreases the resistance to HCl soln. until a min. is reached at 5.78% MgO. Further increase in MgO increases resistance. Observations on the refining and working qualities of the glasses indicate that the viscosity and surface tension of the glasses increase with increasing MgO. The difficulty of melting increases with increasing MgO and in general the substitution of MgO for CaO is not advisable. H. I.

Melting experiments with alumina-bearing rocks. Ludwig Springer. *Keram. Rund.* **36**, 403-6, 426-8(1928).—Glass-melting expts. were performed with a glass of normal compn. and by substituting for quartz sand, either wholly or in part, (1) quartziferous feldspar sand, (2) pumice, (3) greenstone, (4) "Erlan-Gestein," a mixt. of an epidote-bearing granite and epidote- and hornblende-bearing quartzite. The substitutions were so made in general that the % by weight of $SiO_2 + Al_2O_3 + Fe_2O_3$ and of $Na_2O + K_2O + CaO$ were approx. const. Conclusion: (1) Several of these materials have valuable qualities as components of the batch, either as the principal raw material in ordinary glasses, as a coloring medium for green or dark glasses or as admixts. in special glasses. (2) Al_2O_3 in glasses up to a certain amt. is not only not harmful but may be beneficial in improving the chem. stability and assisting in fusion. (3) The use of these substitutes may cause an appreciable saving in alk. batch materials since the rocks themselves contain alkalies or other constituents which are satisfactory as fluxes. (4) Disadvantages of these substitutes are (*a*) the cost of grinding, (*b*) the high Fe content of some of them, (*c*) the difficult fusibility and high viscosity of the glass when too much of the substitutes are used. H. Insley

The heat balance of a glass tank furnace. Robt. D. Pike and Geo. W. West. *J. Am. Ceram. Soc.* **11**, 734-44(1928). C. H. Kerr

Clay products in modern construction. Henri Gilardoni. *Ciment* **33**, 342-9 (1928). F. O. A.

Clays and clay development of Louisiana. J. W. Whittemore. Louisiana State Univ. *J. Am. Ceram. Soc.* **11**, 782-4(1928). C. H. Kerr

Tertiary clays of southern California. Robt. Linton. *J. Am. Ceram. Soc.* **11**, 771-81(1928). C. H. Kerr

Dorr classifiers for clay washing. A. Anable. *J. Am. Ceram. Soc.* **11**, 791-4 (1928). C. H. Kerr

Physico-chemical investigation of the heat-resistant clays from Borowitschi G. G. Urazov and N. I. Vlodavetz. *Ann. inst. anal. phys.-chim. (Leningrad)* **3** 725-45; *Chem. Zentr.* **1927**, II, 2705; cf. **20**, 3789.—*Heating and dehydration curves of hard and soft clays were detd.* The chem. compns. of both kinds and also those of the intermediate ones are almost the same, though the plastic clays contain somewhat more foreign substances, such as feldspar and quartz. All samples contained 13-15% of water. The heating curves show 2 endothermic phenomena, the elimination of hygro-

scopic water at 100–110° and of constitutional water at 320–600° (plastic clays) or 400–600° (non-plastic clays). At approx. 950°, especially with hard clays spontaneous heating occurred, so that the temp. of the substance exceeded in many cases by 150° that of the furnace. The dehydration curves show a gradual elimination of water between approx. 110 and 400° and above 400°. On the other hand, when the temp. is maintained const. at 400°, most of the water is evolved. Hard clays are notably more unstable. In conclusion a scheme for the dehydration of kaolonite is discussed and the results of x-ray analysis of clays are given (cf. Strutinskii, *C. A.* **21**, 3721). C. C. Davis

Blending of clays. I. R. C. Callister. *Trans. Ceram. Soc.* (Eng.) **27**, 124–49(1928).—With 4 ball clays and 4 china clays 15 blends were made and tested. It was found that by blending clays of known properties the following properties of the mixts. could be closely controlled: air drying linear shrinkage, firing shrinkage from dry at 110° to china glost and biscuit conditions, and loss of wt. during firing. Those properties less closely controlled were modulus of rupture, tensile strength, apparent porosity, absorption, degree of vitrification and color. The modulus of rupture proved a good index to the relative strengths of clays and mixts. Ball and china clay mixts. averaged 10% higher strengths than either clay alone. Mixing fine-grained fat, plastic clays with each other gave low strengths. Fine-grained plastic clays mixed with the larger-grained china clays showed strengths above the expected means. Some of the properties of clays are additive, others only approx. so. H. F. K.

Views on the so-called hygroscopic water of clays. Tsuruji Ozakawa. *Sci. Papers Inst. Phys. Chem. Research (Tokyo)* **9**, No. 153, 15–49(1928).—The nature of the hygroscopic water of clays is studied. Intersection points are found on the isotherms which indicate the relation between the quantity of water absorbed and its vapor pressure. O. maintains that the view that water mols are condensed on the surface of clay and that this condensation is only an adsorption is incompatible with the existence of the intersection points. The exptl. results agree with the conclusion that water combines with clay, resulting in the formation of certain hydrates, the compn. of which is ascertained from the intersection points, and that the hydrates form solid solns , the compn. of which varies according to the equil. between the hydrates at various temps. and humidity. A large amt. of exptl. work has been done. L. B. Miller

A new method for testing refractory clays. Albert Granger. Conservatoire National des Arts et Métiers. *Chimie et industrie* Special No., 439(April, 1928).—In testing refractoriness, the smallness of the test pyramids makes it difficult to detect the exact softening point. With some clays a test crucible was found to show signs of softening before the pyramid made from the same clay, while with others there was no noticeable difference. A. Papineau-Couture

The tables of properties of clays and kaolins. Use of the tables for the stoneware clays of the Westerwald region. Fritz Buss. *Keram. Rundschau.* **36**, 219–21(1928).—B. criticizes tables of properties of German clays because the measurement of the properties listed requires elaborate and costly lab. app. A method of classifying different clays from the same deposit or from different deposits is suggested based on the screen analysis, the burning shrinkage and the color after burning. Samples after drying at 110° are crushed in a mortar to a size of about 2 mm., placed in water for several hrs. and screened as a slip through a 4900/cc. screen. The residue on this screen is dried and weighed. A sample of the same material is burned to cone 10 and the shrinkage detd. Clays from the same deposits may thereafter be identified by their similar screen analyses. H. Insley

The dehydration of kaolin. H. A. J. Pieters. Techn. Hoogeschool, Delft. *Thesis* **1928**, 148 pp.—A review with 334 references is given of the literature on kaolin, its constitution, dehydration, rehydration, etc. P.'s work consisted of dehydration and rehydration expts., including static detn. of the soln. pressure of kaolin, the action of HCl and Na_2CO_3 on kaolin and related substances and attempts to synthesize kaolin. The material used was mainly Zettlitz kaolin; other samples analyzed were from Passau and from N. Carolina. For the analysis the KOH method after ignition was found best; HCl decomposes incompletely. Only up to 15.9% of the total alumina dissolves in 2*N* HCl during 6 hrs. on a water bath; nothing in 2*N* Na_2CO_3 soln. The d. was 2.64; after ignition at 700° 2.47; at 1100° 2.67. Kaolin, $Al(OH)_3$ and SiO_2 were found to be hygroscopic; ignited kaolin (metakaolin) was slightly hygroscopic and ignited $Al(OH)_3$ was considerably more so. For the thermal analysis the kaolin was heated in an elec. furnace (10° per min.). Three heat effects were observed: at 100° by moisture escape, at 600° by dehydration, at 950° by exothermic decompn. Kaolin was progressively dehydrated in a nichrome furnace. Air satd. with water vapor at different temps.

was passed over the substance and the temp. detd. for each H_2O pressure at which the kaolin lost wt. From the practically vertical center parts of the dissocn. isobars, (S curves) on which t is largely independent of x, the following values for a p-t curve (dynamical method) were found: p = 17 mm. at 430°, 149 mm. at 475°, 355 mm. at 505°, 760 mm. at 540°. Passau and N. Carolina kaolin gave identical results; at 540° the dehydration is complete. At 17 mm. H_2O pressure 0.7% water was lost at 420° (4 hrs.), 11.6% at 470° (3 hrs.) (90% of total); below 400° 0.4 to 0.6% water escapes. From the data on the quasi monovariable equil. a heat effect of dehydration of 300 cals. per g. kaolin was calcd. Further expts. were made to find the limit of dehydration at p_{H_2O} const. (17.5, 149 and 760 mm.) for different temps., also at 3.6 atm. pressure. Dehydration of more than 13% was obtained for p_{H_2O} = 0 at 470°, for p_{H_2O} = 17 mm. at 490°, for p_{H_2O} = 149 mm. at 510°, for p_{H_2O} = 760 mm. at 580°, for p_{H_2O} = 3.6 atm. at 640°. Dehydration of pholerite is considerably slower: the corresponding values are 510°, 510° and 560° for the first three p_{H_2O}. The grain size (0.5 to 2μ) is not believed to be of great influence. The dehydration follows in general the rules for a solid soln. of water content x. Between about 3 and 13% water the equil. is apparently univariant. Metakaolin (dehydrated kaolin) does not absorb any water at suitable temps. below 700° for p = 149 at 760 mm.; little water was taken up after previous evacuation of the substance. In a nickel-steel autoclave Al_2O_3 ignited at 950° takes up 16 to 17% H_2O, forming a monohydrate at water pressures of 125 and 150 atm. (temp. about 300°); ignition of the oxide above 1100° destroys this absorptive ability. Amorphous SiO_2 (from water glass) takes up 2.7 to 45.7% H_2O at 80 to 130°. Ignited Zettlitz kaolin absorbs up to 14.7% water at pressures of 50 to 130 atm. (2 to 3 days) depending on the previous ignition temp. Up to 550° ignition temp. 14.5%, for 600° to 850° 13.0%, for 900° 12.5%, for 1000° 11.0%, for 1050° 3.0% and 1.6 down to 1.0% for 1100° to 1500° (2 days rehydration, p_{H_2O} between 80 and 120 atm.). A mixt. of Al_2O_3 + 2 SiO_2 takes up only 10.5% water at 100 atm., 2 days; metakaolin under the same circumstances takes up 12 to 13%. Sillimanite takes up 0.7 to 1.3% H_2O at 85 atm., 2 days, nothing after ignition at 1000°. It seems likely that ignition of kaolin over 1100° gives sillimanite + cryst. SiO_2. Static detns. of the soln. pressure of kaolin and pholerite were made in an elec. furnace with a Hg manometer, the tube being evacuated at const. vol. The water yielded was weighed in a $CaCl_2$ tube, after initial evacuation at 400°. For a H_2O loss of 3.4 to 11.5% the p-t curve so detd. agreed well with the dynamic values. The pholerite curve although more retarded by slow decompn. also agrees with the dynamic one and with that of kaolin. Action of Na_2CO_3 on metakaolin indicates that it contains neither free SiO_2 nor Al_2O_3; ignition above 900° only gives a slight soda soly. The Al_2O_3 from metakaolin dissolves almost completely in HCl if the ignition temp. is below 900°; from there on it is very small (Al_2O_3 soly. itself decreases more slowly). Hydrated metakaolin is insol. in HCl, and has a dehydration characteristic like kaolin, yielding its water a little more readily. It is concluded that metakaolin (product between 600° and 900°) is most likely a kaolin anhydride, $Al_2O_3.2SiO_2$. Attempts to synthesize kaolin failed. B. J. C. van der Hoeven

Effect of heat on the crystalline break-up of kaolin. J. F. Hyslop and H. P. Rooksby. *Trans. Ceram. Soc.* (Eng.) **27**, 93–6(1928).—An x-ray investigation of kaolin after heat treatment showed a breakdown at 550° to an α form which is stable to 870°, the occurrence of a β form between 870 and 1000°, after which only mullite and SiO_2 remain. The α- and β-patterns have not been identified. H. F. K.

Feldspar. Arthur S. Watts. *Mineral Ind.* **36**, 203–5(1927).—A review of production and milling. A. B.

Fused quartz. Felix Singer. *Sprechsaal* **61**, 221–2(1928).—Discussion on the prepn. and properties of fused quartz and how it differs from ordinary quartz. Comparisons of such properties as compressive strength, elasticity, dielectric strength, etc., are made with other ceramic materials. R. A. Heindl

The development of the shale planer. C. Forrest Tefft. *J. Am. Ceram. Soc.* **11**, 785–90(1928). C. H. Kerr

Vaccum treatment of clay slips and bodies. H. M. Kraner and A. H. Fessler. *J. Am. Ceram. Soc.* **11**, 725–9(1928).—Since there is only 1.0–1.3% air by vol. in clay slips, the increase in d. due to removal of air must be slight. The dielectric strength of the porcelain body was not increased by vacuum treatment of the slip or body, and there was no noticeable improvement in mech. strength. C. H. Kerr

Formulas for slip calculations. S. R. Hind. *Trans. Ceram. Soc.* (Eng.) **25**, 108–10(1926).—A collection of formulas is given for use in calcns. in connection with slips of clays, various ground materials, and mixts. B. C. A.

The effect of the burning on the unit weight and specific gravity of brick. CHR. K. VISSER. Hochschule Delft. *Intern. Congress Testing Materials* **1927**, II, 321-37.— F. O. A.

White efflorescences appearing on bricks and tiles (during baking). K. ZIMMERMANN. *Klei* **19**, 1-8, 79-80(1927); *Chimie et industrie* **20**, 284-5(1928).—A discussion of the causes of their formation and of the methods of preventing them. A. P.-C.

The pores in brick. G. J. EASTER. *J. Am. Ceram. Soc.* **11**, 764-8(1928).—The resistance to the flow of air through the sample is measured and the pores are arbitrarily considered to be replaced by an equiv. vol. of parallel cylindrical capillaries. The dimensions of these capillaries are then computed. The method is applicable only to bodies having open pores. C. H. KERR

Some common abuses of fire brick. L. S. LONGENECKER. *Blast Furnace Steel Plant* **16**, 809-11(1928).—Two features in furnace construction that involve unduly severe service, irregular joints and the keyed arch roof are discussed. Thinner and better joints can be secured by installing with care brick of uniform thickness and good workmanship. In a keyed sprung arch, brought up to working temp., the entire load is concd. on the semi-soft inner brick ends, because of the difference of thermal expansion of the inner and outer brick ends. A radial furnace arch supported overhead which automatically allows for expansion and contraction and eliminates the skew backs is described. J. W. BOECK

The thermal expansion of fireclay bricks. ALBERT E. R. WESTMAN. Univ. Ill. Eng. Expt. Sta., *Bull.* **181**, 27(1928).—In scope this work covers the detn. of the expansion behavior of 20 brands of fireclay brick of wide range of qualities through temps. from 25° to 900°. The app. used was a rigid water-cooled metal framework within which was placed the electrically heated specimen supported by fused silica end pieces which in turn transmitted the expansion pressure to a dial gage. A multiple base-metal thermocouple with three hot junctions was used to measure temps. In nearly all cases studied the data obtained from these thermal expansion measurements, from petrographic examn. by the powder immersion method and from chem. analysis were in reasonable quant. agreement with the assumption that the lower inflections of the thermal expansion curves were due to the inversion of cristobalite and the upper inflections to the inversion of quartz, these substances being originally present in the raw materials as uncombined silica. It is believed, therefore, that with more accurate methods for detg. percentage expansions due to inversions and more reliable factors for calculating percentages of cristobalite and quartz from such data, useful analyses of fireclay bricks could be made. H. L. OLIN

A laboratory furnace for testing resistance of firebrick to slag erosion. RALPH K. HURSH AND CHESTER E. GRIGSBY. Univ. Ill. Eng. Expt. Sta., *Circ.* **17**, 18(1928).—A cylindrical furnace chamber is supported vertically on rollers and is rotated about its axis during the test. It is heated to any desired temp. with controlled atm. conditions with a blast burner using city gas and air at high pressure. Powd. slag is fed at uniform rate through the burner and blown with the blast onto the vertical faces of standard-sized test bricks which line the chamber, each brick being brought repeatedly and successively into position before the burner and thereby subjected to uniform treatment. H. L. OLIN

Silica brick in the open-hearth furnace. B. M. LARSEN. U. S. Bureau of Mines. *Blast Furnace Steel Plant* **16**, 803-7(1928).—Silica brick, though far from being a perfect refractory, is admirably adapted for arches and supporting loads at temps. close to the m. p., also recrystg. to form an unbroken inner surface covered with a glaze that reflects the radiant heat. Solid silica exists in 4 forms: The crystal forms, tridymite, is stable from 1600 to 2680° F. and cristobalite is stable from 2680 to 3110° F. Cristobalite m. 3110° F. and can be easily supercooled, giving the various forms of quartz glass, nitrosil, etc. The presence of fluxing impurities, which will dissolve silica, tends to hasten the changes, which normally are very slow. Each cryst. form has an α- and β-form stable at low and high temps., resp. The α and β inversions are rapid and reversible. The important change in burning silica brick is the partial recrystn. of the original quartz to form cristobalite and tridymite. The new crystals interlock and grow together in a structure well adapted to resist deformation by external stress, even at high temps. During burning the bricks expand 10 to 11% by vol. because of the partial change from quartz to cristobalite and tridymite. Any portion of the brick which subsequently in service changes from cristobalite to tridymite may undergo an addnl. permanent expansion from 5 to 6%. This is the principal cause of permanent expansion of arches in service. New silica brick composed chiefly of cristobalite expand about 3.5% over a small temp. range, which is perhaps the principal

cause for cracking from rapid heating or cooling at low temps. Al_2O_3 and the alkalies are more dangerous fluxes than most of the other oxides, so mortars contg. clay or Na silicate should not be used in laying up or washing surfaces. The changes occurring in the silica brick in the open-hearth roof arch are given in detail. Fluxing and fusing are the 2 distinct modes of failure in the silica roof. Below 2975° F. only slow wearing away by fluxing occurs. Above this temp. fusion of the hot end of the brick occurs. Definite currents of hot gases may sweep up and impinge on localized areas of the roof, causing overheating and overfluxing. Their control is a matter of furnace design and operation. The causes of spalling and the seasoning of roof brick by flux satn. and recrystn. are discussed. J. W. Boeck

Constitution of silica bricks. K. Endell and E. Pfeiffer. *Ber.* No. 91, *Werkstoffausschusses Ver. deut. Eisenhüttenleute, Sitzb.* **2,** 8(1926); *Physik. Ber.* **8,** 78.—The vol.-temp. diagram of the SiO_2 system is constructed by means of data from the literature. Examn. is made of 41 different bricks, whose customary phys. properties are recorded. Good grades of bricks show an elongation of 0.7–0.8% up to 300°, 0.9% at 600° and 1.0% at 800°. Poor grades give 0.4% at 300°, then a strong elongation between 500° and 600°. After heating at 1450°, a good brick does not retain any permanent deformation, whereas a poor-grade brick remains 0.6 to 0.8% deformed Since the main deformation of good bricks occurs below 300°, the heating of coke ovens should be carefully controlled up to that temp. A. L. Henne

Studies on drying. First experimental results. V. Bodin and P. Gaillard. *Ceramique* **30,** 205–17; *Chem. Zentr.* **1927,** II, 1504.—In a tube equipped with measuring instruments the test sample of clay is dried under known conditions. The conditions for drying a marl, a brick clay and a fireclay were detd. J. S. Reichert

Tunnel kilns for burning firebricks. I. S. R. Hind. *Trans. Ceram. Soc.* (England) **25,** 154–70(1926).—The relative merits of tunnel kilns and other continuous kilns for burning firebricks are discussed. The special requirements and the chief features of design of such tunnel kilns are also outlined. B. C. A.

Continuous and periodic electric decorating kilns. R. J. Eves. *J. Am. Ceram. Soc.* **11,** 753–8(1928). C. H. Kerr

A waste heat drying system involving recuperation. W. T. Windsor and F. C. Westendick. *J. Am. Ceram. Soc.* **11,** 730–3(1928). C. H. Kerr

Notes on firing terra cotta. S. J. McDowell and R. M. Murphy. *J. Am. Ceram. Soc.* **11,** 745–52(1928). C. H. Kerr

A method of testing the probable durability of tank blocks. E. J. C. Bournaker. *Pottery Gazette* **53,** No. 610, VI–VIII(1928).—In a qual. test a chip of the tank block is treated with a 2:1 HF-H_2SO_4 acid mixt. in a Pt crucible and evapd. in a sand bath, after which it is boiled in a 1:1 H_2SO_4 water mixt. After drying at 110° it is examd. for cryst. appearance. A good block should show cryst. appearance markedly. The grog should be held firmly in place by the cryst. matrix of sillimanite and there should be no shedding of the grog during boiling. A poor block shows no cryst. formation. The chip will have a ragged look due to soln. of the bond. In the quant. test a weighed sample cut as near $^1/_2'' \times {}^1/_2'' \times 1''$ as possible, with beveled edges, is treated with 3:2 HF-H_2SO_4 mixt. and heated at 100° for 3 hrs. A detailed description of a lead distn. tank is given. Soly. of 5 blocks was 18.9–5.98%, the lowest soly. indicating the block with the longest service record. R. A. Heindl

Porcelain as an industrial material. H. Handrek. *Keram. Rundschau* **36,** 363–5, 386–8, 410–2, 429–31(1928); cf. *C. A.* **22,** 2039.—Curves showing the effect of suitable and unsuitable glazes on modulus of elasticity, bending strength, tensile strength and impact bending resistance of porcelain are given. Av. values are given for 30 different phys. properties of glazed and unglazed porcelain. Methods of measuring these properties are described. Curves are reproduced which show decrease in tensile strength, compressive strength, bending strength and torsion strength with increase in cross-section of the porcelain and also curves which show the relation of break-down resistance and puncture voltage to temp. H. Insley

The preparation of liquid bright and burnished gold. F. Chemnitius. *Sprechsaal* **60,** 182–4(1927); cf. *C. A.* **22,** 3751.—The complicated constitution of these prepns. in the form of terpenes is discussed. Liquid bright gold is applied to the ware and fired. It results without further effort in a bright shiny gold. The burnished gold is applied as an oxide (in suspension) which after firing must be polished in order to obtain the proper finish. A complete description of procedures to follow in the small-scale prepn. of the two materials is included. Each step leading to the prepn. of the compds. is clearly stated. R. A. Heindl

The history of ceramics. III. The manufacture of porcelain in Italy before the

discovery of hard porcelain in Europe. C. F. BONONI. *Giorn. bibliografia tec. intern.* **4,** 573–88(1928); cf. *C. A.* **22,** 2251. C. C. DAVIS

Colors in ceramics. E. W. ELY. *Bull. Am. Ceram. Soc.* **7,** 311–3(1928).—Some simplification and standardization are recommended. C. H. KERR

Firing ceramic ware with gas. H. L. READ. *J. Am. Ceram. Soc.* **11,** 759–63 (1928). C. H. KERR

The application of liquid fuels in ceramic industry. A. POPOFF. *Sprechsaal* **61,** 195–7(1928).—The advantages of firing ceramic ware in tunnel kilns and intermittent round kilns with fuel oil as against coal or wood are given. Charts are included showing regularity of oil firing against wood firing as found in specific installations. Temps. used and compns. of bodies and glazes manufd. are given. R. A. HEINDL

Calculations derived from [ceramic] industrial practice. PAUL POTTIG. *Sprechsaal* **61,** 215–9(1928).—Drawings show how the raw materials entering into ceramic manuf. as well as the finished product can be diagrammatically kept both by wt. and percentage of materials. Exact knowledge of costs of all raw materials, finished products, overhead and defective ware can be kept by these records. R. A. HEINDL

Proposals for unified tests of ceramic materials. O. KALLAUNER. *Intern. Congress Testing Materials* **1927,** II, 338–58.—Proposals made were: (*a*) A rapid detn. of the harmful effect of lime nodules in burned brick ware. Five specimens are placed in a covered vessel on a support above water which is brought to boiling in 1 hr., and allowed to boil another hr. After 4 hrs. the specimens should be free from defects due to lime nodules. (*b*) Testing roof tile for impermeability to rain. A pair of 3-course tiles is surrounded by sheet iron cemented with litharge and glycerol, and water falls under specified conditions. The tile should remain dry on the under side for 24 hrs. (*c*) An exclusively volumetric detn. of the absorption of ceramic specimens. Detd. on a vol. instead of on a wt. basis, the absorption is expressed more significantly. (*d*) The detn. of sol. salts in ceramic clays. The methods of the Tonindustrie Lab. in Berlin are recommended. (*e*) The detn. of sol. salts in ceramic products should be carried out by similar methods. (*f*) Testing the acid resistance of ceramic products by treating 1 g. with 1.84 H_2SO_4, boiling 30 min., cooling, dilg., adding NaOH and weighing the residue, after drying at 120°. Tests for roof tile should include permeability, absorption, frost resistance, flexure and impact resistance. F. O. A.

Report of Committe C-8 on refractories. G. A. BOLE, *et al.* *Trans. Am. Soc. Testing Materials* **1928** (preprint), No. 51, 7pp.—The report includes definitions on various clays, recommended changes in the ° C. values of certain pyrometric cones, a comparison of long-time and short-time reheat tests on the basis of vol. change, the pyrometric cone equivalents of 8 refractory cements, and a discussion of the sand-blast method of measuring the resistance of refractories to abrasion at high temps. The need of an improved method of analysis of high Al refractories is stated but no recommendation is made. H. F. K.

Recent developments in the testing of refractories. M. C. BOOZE. Chas. Taylor Sons Co., Cincinnati. *Intern. Congress Testing Materials* **1927,** II, 371–4. F. O. A.

The testing of refractory materials. HERMANN SALMANG. Hochschule, Aachen. *Intern. Congress Testing Materials* **1927,** II, 365–70.—Toluene is best for true sp. gr. The air expansion method is best for porosity. Other properties to be tested are soundness at high temps., spalling during temp. change, heat cond., m. p., weakening at high temp. under load and slagging. F. O. A.

Refractories for blast furnaces. V. BODIN. Lab. du Syndicate des Fabricants de Produits Céramiques de France. *Chimie et industrie* **Special No.,** 444–53(April, 1928); cf. *C. A.* **18,** 3461.—A discussion of requirements. Analyses and phys. properties of a no. of French and foreign products which are being used successfully are tabulated. The methods of testing in use in B.'s lab. are briefly outlined. A. P.-C.

Kaolinic refractories and their properties. MARK J. TERMAN. Babcock and Wilcox Co., Pittsburgh. *Blast Furnace & Steel Plant* **16,** 814–5(1928).—Kaolinic material is processed by a new method, which develops its refractory qualities to the fullest extent and produces a recrystd. refractory with a max. uniformity of quality and size. The properties and application of this special refractory are described. J. W. B.

The effect of firing on the chemical and physical properties of refractories. W. MIEHR, J. KRATZERT AND H. IMMKE. Centrallab. und Forschung Inst. des Didier Concerne. *Tonind. Ztg.* **52,** 280–2, 298–301, 323–5(1928).—The chem. and mineralogical properties of refractories were detd. with special reference to the formation of mullite between 1000 and 16,000°. The effects of firing temps., time of firing, size of grain, clay content and alkalies on the formation of mullite were studied by means of the petrographic microscope and x-ray. Crucibles made of mullite were found to be

most resistant to slag action, being much better than alundum crucibles in this respect. It was also found that the firing temp. has an important bearing on the thermal expansion of siliceous clays. One siliceous clay when fired to cone 10 had a very irregular expansion curve due to the rapid vol. changes of different forms of SiO_2 at different temps. By firing this same clay to cone 20 its expansion curve became smooth and much lower than that obtained on the clay fired to lower temps. H. G. SCHURECHT

Method and apparatus for determining the conductivity of refractory materials. GEORGES MEKER. *Céramique* **30,** 445–52; *Chem. Zentr.* **1927,** II, 2000.—A rod 20–40 cm. long, and 5.5 cm. high and wide, is heated at the front side with a Meker burner, and the temps. are taken at the front and several places along the rod. The curves obtained are a relative and technically useful, though not an abs., measure of the thermal cond. G. SCHWOCH

A non-technical description of spalling action. STUART M. PHELPS. Am. Refractories Inst., *Tech. Bull.* No. **24,** 7 pp.(1928).—Causes of spalling are divided into 3 classes, thermal, mech. and structural. LEWIS B. MILLER

Abrasives. V. L. EARDLEY-WILMOT. *Mineral Ind.* **36,** 1–10(1927).—The various abrasives, natural and artificial, are discussed and statistics given. A. B.

Use of hydrochloric acid for testing acid-resisting enamel. A. MALINOVSZKY. *Bull. Am. Ceram. Soc.* **7,** 313(1928); cf. *C. A.* **22,** 1023.—Cast iron sanitary ware must resist HCl. C. H. KERR

Basic open-hearth practice (WATERHOUSE) **9.** Magnesite (HENTON) **18.** The influence of H-ion concentration and electrolytes upon the turbidity, sensitivity and settling rates of certain pleistocene clays (GRAHAM, PEARCE) **2.** Migration of ions from aqueous solutions into glass (QUITTNER) **2.** The relation between coagulation, electrokinetic migration velocity, ionic hydration and chemical influences—an experimental study of clay, quartz and permutite suspensions (TUORILA) **2.** The system: aluminum oxide–silicon oxide (EITEL) **8.**

KUHLEIN, THEO: **Optisches Glas. Unzerbrechl. Glas. Altern. d. Glases.** LEIPZIG: Verslag f. Kunst und Wissenschaft. 63 pp. M. —.40.

Adressbuch der Email-Industrie. REDAKTION DES SPRECHSAAL. Cobourg: Müller and Schmidt. 284 pp.; 6.50 marks. Reviewed in *Chimie et industrie* **20,** 597 (1928).

Glass. SOC. ANON. DES MANUFACTURES DES GLACES ET PRODUITS CHIMIQUES DE ST.-GOBAIN, CHAUNY, ET CIREY. Brit. 284,648, Feb. 2, 1927. A glass to be used for x-ray screens contains PbO 45 and BaO 17% or other suitable proportions of oxides of Pb and Ba detd. by the formula $B \times 1.005^{(P + 350)} = 110$, in which B indicates the content of BaO and P the content of PbO.

Sheet glass. ENOCH T. FERNGREN (to Libbey-Owens Sheet Glass Co.). U. S. 1,684,437–8, Sept. 18. Mech. features.

Sheet glass apparatus. FRANK FRASER (to Libbey-Owens Sheet Glass Co.). U. S. 1,684,440, Sept. 18.

Glass furnace construction. THOMAS B. HART (one-half to Adamston Flat Glass Co.). U. S. 1,685,053, Sept. 18.

Apparatus for feeding mold charges of molten glass. SAMUEL G. STUCKEY. U. S. 1,686,109, Oct. 2.

Apparatus for delivering charges of molten glass. LEONARD D. SOUBIER (to The Owens Bottle Co.). U. S. 1,685,143, Sept. 25.

Drawing sheets or plates of glass. FRITZ ALTHOF. Fr. 635,934, June 13, 1927. An app. is described for drawing plates of glass comprising a metal mouthpiece with a slit opening mounted interchangeably in a body floating on the refractory material.

Glass rings. MILOS KLAVIK. Austrian 108,955, Oct. 15, 1927. A mold is described for making tubular glass bodies and subdividing them into rings.

Apparatus for finishing and annealing lamp bulbs or other blown glass articles. JAMES BAILEY (to Corning Glass Works). U. S. 1,685,349, Sept. 25.

Apparatus (with temperature control device) for annealing glass articles. JAMES BAILEY (to Corning Glass Works). U. S. 1,685,348, Sept. 25.

Metallic coating on glass. MAX ALBRECHT. Fr. 635,813, Sept. 20, 1926. An oscillating basin is described which contains a bath in which the objects to be coated are placed.

Liquid preparations of gold and platinum. P. P. BUDNIKOV. Russ. 3433, Aug. 31, 1927. Reaction products of P-S compds., or Cl-P-S compds. or Ni sulfide or a mixt.

of the above compds. with S-Cl compds. or alkali polysulfides are mixed with Au or Pt salts and are used for hot plating of ceramic or glass ware.

Apparatus for drying clay products, etc. EUGENE A. HULTS. U. S. 1,685,026, Sept. 18.

Magnesite brick. BERRY M. O'HARRA and EDGAR A. SLAGLE (to American Smelting & Refining Co.). U. S. 1,686,876, Oct. 9. Small particles of crushed calcined magnesite are mixed with water contg. $MgCl_2$ in quantity of 5–10% that of the calcined magnesite, and to this mixt. there is added an aq. soln. of NaOH or NH_4OH in quantity approx. equiv. to the $MgCl_2$ so that $Mg(OH)_2$ is formed in contact with the calcined magnesite particles. The material is pressed into bricks, burned to convert the $Mg(OH)_2$ into MgO and the burning is continued at a higher temp. to convert the MgO into periclase.

Furnace for baking porcelain. NGUYEN B. CHINH. Fr. 32,601, Oct. 4, 1926. Addn. to 595,009.

Cleavable plates from ceramic pastes. WILLI HAMPE and MAX RICHTER. Fr. 635,233, May 30, 1927. Plates or the like are provided, at the time of manuf., with a combustible or incombustible but shrinkable layer on the sections of cleavage, so that after baking, the plates can be easily sepd. by a shock.

Abrasive disks. HERBERT R. STRATFORD (to Stratmore Co.). U. S. 1,687,071, Oct. 9. Cloth carrying abrasive material is provided with a backing sheet of vulcanized fiber which, for a section 1 in. wide and 10 mills thick, has a longitudinal tensile strength of over 150 lb. and a transverse tensile strength of over 75 lb.

Abrasive sheets. HERBERT R. STRATFORD (to The Stratmore Co.). U. S. 1,684,748, Sept. 18. A sheet of cellulosic material such as vulcanized fiber is provided with a layer of abrasive grains adhesively secured to one surface of the sheet. Sheet material is used having a tensile strength of not less than 170 lb. per sq. in. in one direction and of not less than 85 lb. per sq. in. in a direction at right angles to the first.

Rubber-bonded abrasive articles. DUANE E. WEBSTER (to Norton Co.). U. S. 1,687,410, Oct. 9. In forming grinding wheels or other abrasive articles, abrasive grains are mixed with rubber latex, vulcanizing agent and an accelerator, coagulation is effected, *e. g.*, by use of Zn acetate, and the coagulated mixt. is then subjected to vulcanization. Cf. *C. A.* **22**, 3273, 3969.

Waterproof sheet abrasive material. CARL A. KLEIN and ROBERT S. BROWN. U. S. 1,687,453, Oct. 9. A base material such as paper or cloth is waterproofed by passing it through a bath of linseed oil contg. a small proportion of paraffin or other suitable wax and maintained at a temp. of 100° or higher; any surplus waterproofing material is removed by heated pressure rollers, an adhesive consisting of a drying oil such as linseed or tung oil and a varnish gum or synthetic resin is then applied, followed by successive applications of abrasive material such as sand and baking after each application of this material (all these operations also being carried out at temps. above 100°). U. S. 1,687,454 specifies a similar preliminary waterproofing followed by application of an adhesive comprising a drying oil and a gum such as dammar or copal and of abrasive material.

Refractory articles of silicon carbide. M. L. HARTMANN (to Carborundum Co., Ltd.). Brit. 284,732, Feb. 4, 1927. Molded articles are made of SiC substantially free from Fe and other easily reducible metals or their compds. The material may be subjected to a preliminary magnetic purification and bonded with pure kaolin 8 and feldspar 2%. Such a mixt. may be moistened with water, molded and fired.

Zircon refractories. LEROY H. MINTON. U. S. 1,684,739, Sept. 18. Zircon is finely ground in the presence of water contg. an org. deflocculent such as tannic acid and the resultant product is shaped and fired.

Tunnel kiln and associated furnace construction. CHARLES F. GEIGER (to Carborundum Co.). U. S. 1,686,083, Oct. 2. A furnace and kiln construction is specified which is suitable for burning *ceramic ware,* etc.

20—CEMENT AND OTHER BUILDING MATERIALS

J. C. WITT

New Dutch cement specifications. ANON. *Zement* **17**, 1105–8(1928). H. F. K.

Italian (cement) specifications. ANON. *Zement* **17**, 1273–4(1928). H. F. K.

Aluminous cement. HENRY LE CHATELIER AND ANDRÉ DUHAMEAUX. *Intern. Congress Testing Materials* **1927**, II, 208–18.—After a review of the chem. constitution

and hydration, the rate of reaction of the cement was followed by observing the absorption of water with time. The speed varies with the temp. It is very slow with a sugar soln. It is assumed that sub-microscopic needles are responsible for the strengths developed. Whereas portland cement or plaster of Paris on exposure to moist air will swell, the alumina cement does not. F. O. A.

The preparation of standard cement samples. ETIENNE RENGADE. *Chimie et industrie* **Special No.,** 424–8(April, 1928).—A discussion of the necessity and difficulty of prepg. standard cement samples, particularly for tensile and compression strength testing, with a brief outline of the chief problems which require discussion and study in this connection. A. PAPINEAU-COUTURE

Measurement and the importance of particle size of cement. DONOVAN WERNER AND STIG GIERTZ-HEDSTRÖM. *Zement* **17,** 1002–5, 1038–42, 1071–6(1928).—A sedimentation app. is described with which the particle size of cements was measured. From the distribution curve and the specific surface of a given cement it was possible to predict quite accurately the compressive strength of the cement at any age, other variables being controlled. The fineness or specific surface had a definite relation to the age at which a cement attains strength. H. F. K.

Chemistry of early-strength cements. HANS KÜHL. *Zement* **17,** 686–91(1928).—Correct compn., thorough mixing, proper burning and grinding are all essentials. The influence of salts such as 2% $CaCl_2$ or the equiv. chloride or nitrate of the alkali and alkaline earth is beneficial, while the salts of the heavier metals are without effect or are injurious. H. F. K.

Early-strength cement and cold water. H. VIERHELLER. *Zement* **17,** 892–4 (1928); cf. *C. A.* **22,** 2041.—The reduction in strength at early ages was much less for aluminous cement than for two others observed at temps. near 0°. H. F. K.

Strength, soundness and shrinkage of cements. W. GEHLER. Materialprüfungsamt, Dresden. *Intern. Congress Testing Materials* **1927,** II, 106–26.—A discussion of the results obtained from the present standard methods and proposals for improvements in specifications so as to improve the probability of securing more concordant results from different labs. on the same cement. F. O. A

Thermal phenomena in the setting of portland cement. P. JOYE. Univ. Fribourg, Switzerland. *Intern. Congress Testing Materials* **1927,** II, 219–30.—The sp. heat of the ground clinker used was 0.199, obtained by suspending in toluene and heating electrically as compared with 0.199 and 0.195 obtained by calcg. The set cement (25% H_2O) in the solid had sp. heat 0.332 and in the powder 0.334. On heating to const. wt. at 110–5° the cement lost 9.9% of its wt. and the sp. heat was 0.244. A concrete dam of about 350 cu. m. reached a max. temp. rise of about 25° in 2 weeks and then cooled down very slowly. The total heat evolved was at least 48 cal. per kg. cement, but in the lab. all values were below 40 cal. The heat evolved varies with the initial temp. It seemed to be greater in the presence of diatomaceous earth than in its absence. F. O. A.

Determination of free lime in cinders and cements. E. DIEPSCHLAG AND A. MATTING. *Zentr. Hütten- u. Walzwerke* **31,** 363–6, 377–80, 394–8; *Chem. Zentr.* **1927,** II, 1194.—The authors discuss first the occurrence of free CaO in cinders and cements and then give a crit. description of the various methods in use for detg. it Their own expts. involved its detn. by means of H_2O contg. CO_2, pure H_2O, microscopical examn. and titration with $AcONH_4$. Microscopical examn. in polarized light is useful for qual. purposes; for quant. purposes only titration with $AcONH_4$ is of use. G. SCHWOCH

The mechanism of the chemical disintegration of cements. HENRI LAFUMA. *Chimie et industrie* Special No., 431–3(April, 1928); cf. *C. A.* **22,** 150.—From a discussion of the mechanism of the action of $CaSO_4$ and of sea water on portland and aluminous cements, L. concludes that this phenomenon is similar to the hydration of anhyd. compds.; when the reaction takes place directly with the solid constituents of the cement (as is the case with portland cement), internal stresses are set up (due to expansion) which may be sufficient to disrupt the mortar or to disintegrate it more or less rapidly; if, on the other hand, the reaction takes place only after the constituents have been dissolved in water (as is the case with aluminous cements) there is no expansion, and the crystn. of the reaction products may even increase the strength of the mortar. Slag cements apparently contradict this theory, as they seem to fix CaO without previous soln. of its constituents. A. PAPINEAU-COUTURE

Some sources of error in the determination of the loss on ignition of cements. G. BAIRE. Soc. des Ciments Français. *Chimie et industrie* **Special No.,** 429–30(April, 1928); cf. *C. A.* **20,** 488.—Results of tests are given to show that when coal is ignited

simultaneously in the same muffle as cements the loss on ignition of the latter is increased by reduction of SO_3 and probably also by partial reduction of Fe_2O_3 to FeO.
A. PAPINEAU-COUTURE

Report of the kiln commission of the Society of German Portland Cement Manufacturers. E. SCHOTT. *Zement* **17,** 1198–1201(1928). H. F. K.

Waste heat in portland cement manufacture. HENRY POOLEY. *Engineering* **125,** 497–8, 562–3(1928).—A discussion of the effect of waste heat boilers, spray feed and filtration of slurry, and long kilns on heat economy. RAYMOND WILSON

Crystal forms in technical portland cement clinker. III. A. GUTTMANN AND F. GILLE. *Zement* **17,** 618–9(1928); cf. *C. A.* **22,** 3273.—A newly observed, weakly refracting form is described. The optical consts. are α 1.55, γ 1.56. The name epezite is suggested. H. F. K.

Action of sulfates on the components of portland cement. T. THORVALDSON, V. A. VIGFUSSON AND R. K. LARMOUR *Trans. Roy. Soc. Canada* [3], **21,** Sect. III, 295–310(1927); cf. *C. A.* **20,** 2400–1; **22,** 2649.—Mortar bars $^1/_8 \times {}^5/_8 \times 7^1/_2$ in. were made from the above pure substances and standard Ottawa sand, distd. water being used for gaging. A mix. of 1 of the ingredients to 5 of sand was used in the earlier expts. and later a mix of 1 to 7.5. After curing the bars were placed in the sulfate soln. and the expansion of the bars was measured from time to time over a period of 2 years. The results showed that solns. of Na_2SO_4 react on but one of the components of portland cement, tricalcium aluminate, while disintegration in solns. of $MgSO_4$ is the result of the sulfate action on all 3 constituents. The reaction, however, is more rapid with the tricalcium aluminate. Mortars made from tricalcium silicate and from dicalcium silicate to which tricalcium aluminate was added disintegrated rapidly in solns. of both Na_2SO_4 and $MgSO_4$. Mortars made from a composite of the 3 major constituents of portland cement had the usual strength of similar mortars made from a normal portland cement and in relation to the action of Na_2SO_4, $MgSO_4$ and $CaSO_4$ solns. behaved like the normal cement. Steam treatment of the various mortars increased the resistance against sulfate action enormously. The action of the steam is apparently chem., since it affects lean and rich mortars to about the same extent. J. W. SHIPLEY

Development of cracks in glass plates used in making cement pats. F. SCHOTT. *Zement* **17,** 1134–7, 1169–72(1928).—Pats adhere to the glass plates more frequently after water curing than after air curing. Unsound pats air-cured adhered only about a day but during that time cracks developed. On slightly roughened glass surfaces the phenomenon occurs more surely. A cryst. growth found to be $Ca(OH)_2$ is responsible for the destructive action. The fineness of the cement used is apparently without influence on this tendency to adhere. H. F. K.

Burning processes in the shaftkiln. HANS KÜHL. *Zement* **17,** 859–62(1928).—Cylinders of powd. coke and coal mixed with raw materials for cement were heated to det. the temp. and time required to consume the C. No appreciable effect on the C was noted in one-half hour heating periods at temps. below 900°. The consumption of C depended much more on temp. than on fineness of particles. H. F. K.

New cement-burning process in the high duty shaftkiln. "System Andreas." KARL BIEHL. *Zement* **17,** 970–3(1928).—See *C. A.* **22,** 4219. H. F. K.

Heat balance in rotary cement kilns. HENRY POOLEY. *Engineering* **126,** 219–20 (1928). RAYMOND WILSON

An American pozzolana and its effect on portland cement concrete. E. LEE HEIDENREICH. *Rock Products* **31,** No. 20, 39–44(1928).—A discussion of the use of pumicite as an admixt. and replacement for cement in concrete. RAYMOND WILSON

Volumetric changes in portland cement mortars and concretes due to changes other than variables in temperature. RAYMOND E. DAVIS. Univ. of Cal. *Intern. Congress Testing Materials* **1927,** II, 145–66.—A progress report. Mortar bars shrink in air about 0.15% to a const. in about 1 year, the shrinkage being independent of the amt. of lime used (max. lime 1:1). Brick piers in air expanded at first and then shrank. Lime seems to promote the swelling when the humidity is high. When the mortar is cast in a nonabsorbent mold it does not behave as it does when used in brickwork. Numerous expts. have been made on vol. and wt. changes in granite concrete under a variety of conditions yielding numerous conclusions too detailed and varied for abstracting. F. O. A.

German concrete products industry. F. HOFFMANN. *Zement* **17,** 630–5(1928).—Some types of machinery and methods used in the concrete block and tile manuf. are illustrated and discussed. H. F. K.

A contribution to the study of concrete. G. MAGNEL. Univ. Gand. *Intern. Congress Testing Materials* **1927,** II, 139–44.—$CaCl_2$ improved the strengths at 3, 7

and 28 days of 3 slag cements and hurt those of one. Deviation from Abrams water-cement ratio law was noted when making concrete from crushed porphyry and powder of the same as fine aggregate, possibly due to a pozzolanic action. Preliminary results on resistance of concrete to impact indicate that a slump of 5 cm. gives better results than a slump of 1 cm., in spite of the fact that the strength to compression goes the other way. Crushed stone gives better results than gravel. The correlation between impact and compression resistance is poor. F. O. A.

Contraction and expansion of concrete. Experimental results. H. Rabozee. École militaire, Brussels. *Intern. Congress Testing Materials* **1927**, II, 167–71.—Variations in lengths are caused by chem. changes during setting and hardening, changes in temp. and in humidity. The chief changes are due to the latter, being 0.036% in an aluminous cement, 0.045 in an early strength portland and 0.076 in a slag cement concrete. Age did not seem to affect the intensity of the phenomena. F. O. A.

Mortar and concrete. E. Probst. *Zement* **17**, 899–905, 943–5(1928).—Concrete specimens carrying 33–85% sand decreased in resistance to wear and increased in absorption with the higher sanded mixes. Lean mortar and concrete mixes were less affected by 12 months' action of $MgSO_4$ solns. where the test pieces were faced with a rich mortar, indicating the effect of porosity on the resistance to destructive solns. H. F. K.

Design of concrete mixtures. R. W. Crum. Iowa Highway Commission. *Intern. Congress Testing Materials* **1927**, II, 32–60.—Either the water-cement ratio or void-cement ratio is very useful in designing concrete mixts., but the preliminary work should be done with materials to be used in the field and under conditions as close to those of the application as possible. Methods of putting the water-cement ratio control into practice are discussed. F. O. A.

The adjustability of early-strength concrete in tension and compression specimens. Bernhard Möhlmann. *Zement* **17**, 390–9, 581–7, 619–23, 658–60, 691–6, 1137–40 (1928).—The equipment used in this investigation consisted of a 500-ton compression, a 50-ton transverse, a 3-ton tensile machine and Martens mirror app. for measuring the changes in length of the specimens under load or tension. The age, kind of cement, consistency of batch, type of aggregate, mix, curing and size of test pieces were the factors considered in relation to the ability of concrete to adjust itself under test. The modulus of elasticity (E) was found to increase with age of specimen and to be greater for the early strength cements than with normal portland cements. Factors decreasing the value of E are increased H_2O content, increased size of specimen, and increasing span. Gravel graded small and having a high voidage also decreases the modulus. For like dimensions E for compression is greater than for tension. With increasing strength the ratio of compression E to tension E decreases. In general the factors increasing the strength of concrete also increase E. H. F. K.

Effect of the length of the mixing period on the quality of the concrete mixed in standard pavers. J. L. Harrison. *Public Roads* **9**, 93–111(1928).—Comprehensive field tests were made on the compressive strength of samples of concrete taken after varying mixing periods. The results indicate that concrete is not improved by mixing for greater lengths of time than 45 secs. L. B. Miller

Graphic method of calculating the raw meal. R. Grün and G. Kunze. *Zement* **17**, 1166–9, 1201–4(1928).—The use of the right-angled triaxial compn. diagram is discussed. With it comes a clearer understanding of the compn. of the resulting cement and its nearness to the unsound limits, of the possible change in CaO content, of the contents of the several constituent minerals, and of the relation between the compn. and the strength characteristics of the product. H. F. K.

Geseke chalk formation and its use in the manufacture of natural cement. Haegermann. *Zement* **17**, 856–8, 894–8(1928).—Because of the non-uniformity in the deposit, even within a stratum, and the excessive Ca present, the material does not burn to a good cement. The product made therefrom is a weakly sintered marl and the blast furnace slag mixed. H. F. K.

Shrinkage effect of Celite in mortar and concrete. A. S. Levens. Univ. of Minnesota. *Eng. News-Record* **101**, 507–8(1928).—Results are given of tests made to det. the effect of Celite on shrinkage of mortar and concrete. *Conclusions.*—(1) The shrinkage of 1:3 mortar is increased 10–25% when Celite is added in amts. greater than 2%. (2) The shrinkage of 1:1½:3 and 1:2:4 concretes is not materially affected by incorporation of 2 and 3% of Celite, resp. (3) The shrinkage of 1:3:6 concrete is increased 40% when 5% Celite is added. R. E. Thompson

Some attempts to steam cure test pieces to attain twenty-eight-day strengths in two days. Karl Biehl. *Zement* **17**, 654–7(1928).—A 50-l. autoclave capable of 50

atm. pressure was used in this work. Twelve cements were used in making test pieces to be steamed. Approx. 28-day values resulted from 8 hrs. steaming at 16 atm. (200°). The strength found increases generally with increased temp. and time until a max. is reached beyond which the values fall. H. F. K.

Disintegration of concrete due to magnesia cement. H. RICHARZ. *Tonind.-Ztg.* **52,** 1593–4(1928).—About 6 months after replacing the surface of a magnesia cement floor with portland cement mortar the latter began to disintegrate; the explanation was given as being due to the magnesia in the base. F. O. A.

Protection of concrete by chemical means. C. R. PLATZMANN. *Chem.-Ztg.* **52,** 657–8(1928).—Impregnation of the concrete surface with a fluosilicate soln. affords some protection against weak acids and other destructive solns. R. W.

Poured concrete columns with circular reinforcement. R. SELIGER. Hochschule, Wien. *Beton Eisen* **27,** 329–35(1928). F. O. ANDEREGG

Examination of reinforced concrete structures near the sea in the Dutch East Indies. C. WOLTERBEEK. Rijkswaterstaat, Zutphen. *Intern. Congress Testing Materials* **1927,** II, 172–83.—Trouble has occurred especially above high-water mark because of the rusting of reinforcing rods where the concrete was not sufficiently dense or protected. Repairs were made by chipping out the poor concrete and cleaning rust off the rods before gunnite treatment. F. O. A.

Destruction of concrete by active carbonic acid. KARL BIEHL. *Zement* **17,** 1102–5 (1928).—The attack of concrete by certain waters is due to the active CO_2 present. While it is possible to compute the amts. of the gas present in its several combined and free forms, the p_H detn. is considered the most definite information regarding the corrosive properties of the water. H. F. K.

Alite. ERNST JÄNECKE. *Zement* **17,** 756–60, 792–7(1928); cf. *C. A.* **21,** 999.—A full discussion of the constituent minerals of cement clinker and their characteristics is given, including compn.-temp. diagrams and thin-section photomicrographs. The minerals are alite ($8CaO.Al_2O_3.2SiO_2$), belite (beta $2CaO.SiO_2$), celite ($2CaO.Fe_2O_3$ in isomorphous mixt. with $4CaO.Al_2O_3.Fe_2O_3$) and felite (probably alpha $2CaO.SiO_2$). The alite and belite are similar in compn. except for the substitution of Al for half of the SiO_2. These are isomorphous and give practically identical Röntgen-ray patterns, yet are not often found as mixed crystals except where aided by the presence of considerable amounts of Fe_2O_3. No $3CaO.SiO_2$ exists as such. The CaO in alite may be replaced by BaO and SrO. The setting and hardening of cements depend upon the formation of hydrates of CaO, $2CaO.SiO_2$, and $2CaO.Al_2O_3$ at the expense of alite. Belite hydrates more slowly. Celite seems to be converted into $2CaO.Al_2O_3.6H_2O$ and $2CaO.Fe_2O_3.6H_2O$. H. F. K.

The achievements of the U. S. S. R. (Russia) in the investigation and production of siliceous building materials during the past decade. B. SHVEZOV. Inst. Silicate Study, Moscow. *Intern. Congress Testing Materials* **1927,** II, 240–9. F. O. A.

Effects of moisture changes on building materials. R. E. STRADLING. Dept. Sci. Ind. Research (Brit.). *Building Research Bull.* No. **3,** 22 pp.(1928).—A résumé of the effects of free water, combined water and sorbed water. In addn. to brief discussions of direct disintegration, soln., osmotic pressure, transmission, crystn. and frost action, typical curves showing the effect of the quantity of sorbed water on the crushing strength and the stress-strain ratio are given. A well-selected bibliography is included. RAYMOND WILSON

Specifications for alabaster. PETER P. BUDNIKOV. *Zement* **17,** 1070–1(1928). H. F. K.

Structural gypsum. HENRY J. SCHWEIM. *Pit and Quarry* **16,** No. 3, 53–62, 87–9 (1928).—A résumé of test data on strength and other physical properties of gypsum mortar. RAYMOND WILSON

Slate. CHAS. H. BEHRE, JR. *Mineral Ind.* **36,** 527–31(1927).—Production, technology and uses are discussed. A. B.

Production and hardening of building materials of slag. FRIEDRICH HUTH. *Allgem. Brauer- u. Hopfen-Ztg.* **67,** 1151–2; *Chem. Zentr.* **1927,** II, 1747.—A brief description of the manuf. of building stone from slag. C. C. DAVIS

Methods for and results of rock-tests for road-making purposes. RAGNAR SCHLYTER. *Intern. Congress Testing Materials* **1927,** II, 375–97.—The testing methods of the U. S. Bureau of Roads are emulated since these "had advanced farthest in respect of being able to utilize and benefit by the test results for judging the suitability of a road-making material for its purpose." F. O. A.

Volume changes in sand with varying moisture content. E. STAUDT. *Zement* **17,** 1077–8(1928).—The bulking of 2 sands of similar screen analysis was from 25 to 38%

when the moisture content was 4–5% in each case. Higher moisture content decreased the bulking effect. H. F. K.

Testing the compressive strength of brick. H. BURCHARTZ. Materialprüfungsamt, Berlin. *Intern. Congress Testing Materials* **1927**, II, 315–20.—The old method of cementing 2 half bricks together and then placing in the compression machine after making the sides parallel does not give as good results as with cubical specimens cut from the bricks. Cylinders cut from the brick gave the lowest strengths. The size of the cube has some effect. F. O. A.

The effect of the composition of the mortar and of the quality of the stone on the weathering of masonry. J. A. VAN DER KLOES. *Intern. Congress Testing Materials* **1927**, II, 309–14.—The expansion of Na sulfate as it crystallizes from supersatd. soln. is taken as an indication of the danger to masonry of crystg. salts. An instance is cited of a masonry wall being struck lightly whereby the surface crust was broken and the soln. which filled the wall could leak out. The danger of excess lime in mortar may sometimes be serious and should be avoided by adding some pozzolanic material to combine with it. F. O. A.

Rapid freezing tests of stones. ANON. *Intern. Congress Testing Materials* **1927**, II, 280–308.—Cubes of 7 cm. edge are dried at 100° for 24 hrs., placed in distd. water and the pressure is lowered to 60 mm. for 15 min. They remain in the water for 7 days at atm. pressure and are then plunged into a $CaCl_2$ soln. of 25° Bé. for 4 hrs. and are then washed with water. F. O. A.

A photographic study of the weather resistance of certain sandstone. LEO MADDALENA. *Intern. Congress Testing Materials* **1927**, II, 275–9. F. O. A.

Weather resistance of rocks. A. STEUER. Hochschule, Darmstadt. *Intern. Congress Testing Materials* **1927**, II, 263–6. F. O. A.

The origin and weathering of stones in old Dutch buildings. A. L. W. E. VAN DER VEEN. *Intern. Congress Testing Materials* **1927**, II, 267–74. F. O. A.

Instructions for the cutting and preservation of timber for mines. SALVATORE FOIS. *Rass. min. met. ital.* **68**, 73–7(1928).—A description, including various methods for preserving the wood by treatment with chemicals. C. C. DAVIS

The aging of wood by ozone. ROGER LYON. *Chimie & industrie* **Special No.**, 662–4(April, 1928).—The changes undergone by wood on seasoning by prolonged storage comprise formation of amorphous products in the cells of the medullary rays and of the ligneous parenchyma, increase in the tannic compds., and increase in the acidity resulting in decrease of the p_H value of the solns. obtained by maceration of the wood. These changes do not take place in the kiln-drying of wood, but do take place in the artificial aging by means of O_3, a 2-months' treatment giving the wood the same properties as several years of natural aging. A. PAPINEAU-COUTURE

Industrial application of p_H: distinction between green and seasoned wood. R. LEGENDRE. Office national des recherches et inventions. *Chimie & industrie* **Special No.**, 665(April, 1928).—See *C. A.* **22**, 999. A. PAPINEAU-COUTURE

Gypsum (MYERS) **18**. The determination of free lime (RATHKE) **7**. P [manufacture of slag cement] (Brit. pat. 285,055) **18**. Rubber-surfaced roads, floors, etc. (Brit. pat. 285,203) **30**.

Le ciment portland artificiel. Fabrication, propriétés. Mortiers et bétons. Bruxelles: S. A. M. Weissenbruch. 120 pp. F. 10.

NEWELL, A. C.: **Wood and Lumber.** Peoria, Ill.: Manual Arts Press. 211 pp. Reviewed in *Expt. Station Record* **58**, 646(1928).

Cement. JOHN A. THOMPSON. Fr. 635,503, June 3, 1927. Cellular cement made by chem. reactions which expand the cement is allowed to set under reduced pressure.

Portland cement. AMMELUTHER WERKE BRAUNSCHWEIG DER MIAG MÜHLENBAU UND INDUSTRIE A.-G. Brit. 284,294, Jan. 27, 1927. A white cement is produced from colored raw materials by adding small quantities of materials such as metallic halogen compds., phosphates or borates, which on heating give colorless melts, with the coloring components of the raw materials. Reducing agents and fluxes also may be used. Brit. 284,295 specifies the production of colored cements from colored raw materials with the further addn. of pigments such as oxides of Cr, Ni, Co and Cu, together with inorg. salts such as metallic halogen compds., phosphates and borates adapted to combine with the pigments to form colored melts on heating. With ferru-

ginous raw materials the calcination is effected under reducing conditions and metallic iron is afterward removed.

Cellular cementitious materials. George B. Hinton. U. S. 1,687,067, Oct. 9. A cement pulp is aerated in the presence of a frothing flotation agent such as a suitable oil by use of small bubbles of air of substantially the size of the pores desired in the finished product. These bubbles may be formed by subdividing an air stream by passing it through a screen in an app. which is described. Cf. *C. A.* 22, 1026.

Concrete. Harold P. Hayden (to Barber Asphalt Co.). U. S. 1,684,624, Sept. 18. In effecting curing of concrete and stabilization of its water content, the concrete, when poured, is provided with a permanent impervious bituminous coating.

Concrete. Harold P. Hayden (to Barber Asphalt Co.). U. S. 1,684,671, Sept. 18. Evapn. of water from cement concrete during the curing period is prevented by applying an adherent film of asphalt paint or other suitable material impervious to water.

Reënforced concrete. Richard E. Dill. U. S. 1,684,663, Sept. 18. During the setting of green concrete contg. reënforcements, bonding of the reënforce with the concrete is prevented by coating with asphalt or the like and the reënforce is finally subjected to tension.

Asphaltic road material. William C. West (to West Process Pavement Co.). U. S. 1,685,304, Sept. 25. See Can. 279,421 (*C. A.* 22, 2836).

Paving. Berry, Wiggins & Co., Ltd., and H. H. Holmes. Brit. 284,908, May 16, 1927. Graded stone or the like used in road making or foundations is mixed with dry powdered material such as chalk, flue dust or granite dust which absorbs water from tarry material subsequently applied and serves thus to increase the viscosity of the latter.

Artificial stone. G. Knudsen (trading as Borgestad Fabrikker). Brit. 284,576, Oct. 23, 1926. A filler of granular olivine mineral or of Mg orthosilicate is mixed with a binder of material such as talc and MgO, which combine when heated to form Mg orthosilicate. The mixt. is formed into a paste with water, sirup or the like, molded and finally heated to somewhat below the m. p. of Mg orthosilicate, to obtain an artificial stone resistant to heat and to alkalies.

Porous artificial stone. K. Schenkel. Brit. 285,470, Feb. 19, 1927. Grain starch 2 is formed into a gel with water 12 parts and water 70 parts more is added. About 10% of calcined gypsum is then added and the resulting mass is molded. When set the product may be used as an absorbing medium for drying or in elec. storage batteries, etc.

Sheet material for flooring. A. O. A. Backstrom. Brit. 284,205, Jan. 24, 1927. A mixt. such as wood pulp and waterglass is pressed into sheets which are suitable for use as a backing for parquetry flooring.

Surface resistant to abrasion. Colin G. Fink and Arthur H. Kopp (to American Abrasive Metals Co.). U. S. 1,686,150, Oct. 2. Articles such as stair treads comprise a base of iron or other suitable cast metal in the surface of which grains of carborundum, emery or other wear-resisting material are embedded and these grains are individually surrounded by an alloy such as Sn alloyed with the adjacent iron.

Bituminous compositions. H. Laderer. Brit. 284,246, Jan. 25, 1927. A mixt. contg. natural bitumen and shale dust is used for road making or for manuf. of roofing tiles, building blocks, drain pipes, pillars, etc.

Synthetic resin fiberboard. Albert L. Clapp. U. S. 1,684,755, Sept. 18. Wood flour and a pulverized synthetic resin are incorporated into an aq. cellulosic pulp, the pulp is sheeted and the sheet is subjected to heat and pressure.

Saturator for testing samples of roofing felt, etc. Floyd W. Adams (to The Barrett Co.). U. S. 1,685,078, Sept. 25.

Kiln construction for drying wood, etc. John F. Hope and John T. Hope. U. S. 1,684,627, Sept. 18.

Preserving wood. Louis Bringer. Fr. 635,341, May 31, 1927. Wood is submitted alternately to heat and vacuum to increase the porosity of the wood, then cold liquid antiseptic is allowed to flow on the wood, which is reheated with hot air or steam.

21—FUELS, GAS, TAR AND COKE

A. C. Fieldner

Report of the National Fuel and Power Committee. Lord Melchett, *et al.* *Chemistry & Industry* 47, 998(1928).—The recommendation is made that the Government make an investigation in a limited, designated area, of the technical and economic

aspects of an area gas-supply system comprising an interconnecting network of pipe lines fed by a no. of gas works, coke ovens and the like. Work on the low-temp. carbonization of coal is commended, and the statement is made that "there appear to be several processes now entering the com. stage." Improvement in coke-oven practice is urged strongly, better utilization of low-grade fuel (perhaps for power generation at the mine itself), a more general exchange of technical information among fuel technologists and users, further experimentation in the use of high-pressure steam and pulverized fuel in ships of different types, the advantages of the purchase and sale of coal upon specifications, and the need for fuel technologists are treated in the Report.
W. C. Ebaugh

Notes on recent developments in fuel technology. R. Wiggington. *Fuel in Science & Practice* 7, 427–9(1928).—Brief reviews of the following subjects: coal *vs.* oil, elec. ships, luminous bacteria, water purification. D. A. Reynolds

Further development in the recovery of fuels from furnace residues in Germany and abroad through the process of dry magnetic treatment. G. Ullrich. *Wärme* **50**, 563–5; *Chem. Zentr.* **1927**, II, 1777.—A review, with a description of a plant of the German railways, a gas works in England and power plants in the Philippines and in Japan. C. C. Davis

Use of the Endell heating microscope for testing solid fuels. E. Berl and H. Schildwächter. *Brennstoff-Chem.* 9, 159–60(1928).—The app. consists of a small elec. tube furnace, the tube of which is illuminated by a small arc light, and a microscope of 45 diam. magnification. By use of an inert atm. (H_2, N_2 or CO_2) in the tube the destructive distn. of a coal sample can be observed. Temps. of initial decompn., tar evolution, coke formation and end of gas formation are observed. J. D. Davis

Ignition of solid fuels. H. Greger. *Brennstoff-Chem.* **9**, 232–4(1928).—Factors influencing ignition of solid fuels are discussed and lab. app. is described for detg. ignition temps. The app. consists of a vertical glass tube 20 mm. in diam., the bottom of which projects into a sand bath contained in an iron crucible heated by a gas flame. A quartz-glass thermometer graduated to 750° is passed through a stopper at the top of the tube and the bulb is covered with the 8-cm. sample sized 10 to 20 mesh, which rests on the sand at the tube bottom. Air (1 l. per min.) is drawn through the heated sand and thence through the sample by a water pump connected to a top outlet of the tube. A uniform heating rate (8–10° per min.) is maintained until a sudden rise in the temp. shows the ignition point has been reached. J. D. Davis

Waste liquors from the dry distillation of solid fuels. I, II, III and IV. K. Thumm. Landesanst. f. Wasser-, Boden- u. Lufthyg., Berlin-Dahlem. *Kl. Mitt. Ver. Wasserversorg. Abwässerbeseitig.* **1**, 141–9(1925); **2**, 1–9, 109–13, 236–42(1926); *Chem. Zentr.* **1927**, II, 1744–5.—The work comprises a very detailed description of the aq. decompn. products which are formed during the dry distn. of solid fuels, such as mineral coal, brown coal, peat and wood. Special reference is made to the phenol content, with numerous references to the literature. C. C. Davis

Valorization of mined fuels. A. Folliet. *Rev. chim. ind.* **37**, 182–6(1928).—A review of the different furnaces used in the low-temp. distn. of coal. P. Thomasset

Prepared fuels from gasification of coal. A. A. Potter and H. L. Solberg. Purdue Univ. *Power* **68**, 445–7(1928).—A discussion of the manuf. and use of *producer gas, blast-furnace gas, blue water gas* and *carbureted water gas.* D. B. Dill

The composition, classification, preparation, storage, and handling of gaseous fuels and the products of the carbonization industry. T. Campbell Finlayson. *Gas. J.* **183**, 666–8(1928).—A review. F. S. Granger

Fluid fuels. A. E. Dunstan. Anglo-Persian Oil Co. *J. Inst. Fuel* **1**, 373–80 (1928).—A general discussion of the use and production of fluid fuels. L. B. B.

Determining the ignition point of liquid fuels. Fr. Hoffmann. *Arch. Wärmewirt.* **9**, 213–9(1928).—A critical review of about 12 papers. Ernest W. Thiele

What is being done about prepared liquid fuels. A. A. Potter and H. L. Solberg. Purdue Univ. *Power* **68**, 604–5(1928).—A discussion of *liquefied coal, synthetic motor fuels, colloidal fuel* (which is a suspension of coal dust in fuel oil), *alcohol* and *shale oil.*
D. B. Dill

Dynalkol. Hugo Novák. *Chemický Obzor* **1**, 89–91(1926); *Chem. Zentr.* **1927**, II, 1319.—N. points out the advantages in using dynalkol (mixt. of 60% benzene and 40% alc.) as a motor fuel. A special advantage is the possibility of using high compression and at the same time having an easy start of the motor. G. Schwoch

Excise on benzene for internal-combustion motors. J. S. Turski. *Przemysl Chem.* **12**, 307–14(1928).—Increased use of mixed motor fuels is recommended.
A. C. Z.

Incomplete combustion in automobile engines and its economical and hygienic significance. W. Liesegang. *Z. angew. Chem.* **41,** 712-3(1928).—L. reviews the published data, which show that combustion in an automobile engine is far from complete, and that the products of incomplete combustion, especially CO, are a menace to public health in the large cities. G. Calingaert

The calculation of flame temperatures. A. J. V. Underwood. *Fuel in Science & Practice* **7,** 455-63(1928).—The calcn. of flame temps. is laborious. A method of calcn. based on that of Goodenough and Felbeck has been used to construct charts, called dissocn. charts, from which the temp. can be obtained graphically. From the energy contents of CO_2, H_2O and O_2 in waste gases the flame temp. can be detd. from the charts. D. A. Reynolds

New tests with benzene separators. H. Rossberg. *Gesundh. Ing.* **51,** 330-3 (1928).—Two sepg. systems, the "Kutzer" built by G. Horkner and the "Argus III" built by Schnutenhaus and Linnman, were tested. Tables contg. the exptl. results are given. Efficiencies for the first type ranged from 92.0 to 99.4%, while for the second type the efficiencies ranged from 54.1 to 98.5%. Wayne L. Denman

Fuel pumps of compressorless Diesel engines. Otto Holm. *Arch. Wärmewirt.* **9,** 258-61(1928).—Many details are given of the design and construction of these pumps. Ernest W. Thiele

Clear heat diagrams. F. W. Stockmeyer. *Arch. Wärmewirt.* **9,** 223-4(1928).—S. proposes to represent heat quantities by areas, vertical distances representing temp. and horizontal, heat capacity. Ernest W. Thiele

High-capacity boilers for use with wood-working waste. V. W. Granberg. *Arch. Wärmewirt.* **9,** 69-74(1928).—A Finnish boiler plant for handling a great variety of waste is described. The upper portion of the grate is nearly horizontal, the larger part is steeply sloped, with a small horizontal grate for ash at the bottom. Up to 43.5 kg. per sq. m. per hr. was evapd. at 20 atm. with good economy. E. W. T.

Improvements of steam boiler plants. Peter. *Arch. Wärmewirt.* **9,** 157(1928).—P. proposes to reverse the direction of chain grates, so as to bring the ashes out the front. This would help ignition of the coal. He also describes a chain grate using wire screen, to be put in a fire-tube boiler. It was not found durable. E. W. T.

$10,600 saved yearly in a chemical plant. W. H. Scott. Merrimac Chem. Co., No. Woburn, Mass. *Power* **68,** 508-10(1928).—Savings were effected by installation and use of flue-gas thermometers, CO_2-recorders, steam-flow air-flow meters and steam meters. D. B. Dill

Some physical properties of marine animal oils. Henri Marcelet. *Chimie et industrie* **Special No.,** 531(April, 1928); cf. *C. A.* **21,** 3757.—Analysis of 40 different oils (nature of the oils and results of analysis not given in detail) was made to see if they were suitable as fuels in Diesel engines. Calorific values varied from 8593 (*Pseudorca* oils) to 10790 cal. (oil of *Centrophorus granulosus*), and with any given oil of given origin it increased with the lightness in color of the oil. The flash point varied from 175° (oil of *Gadus morrhua*) to 312° (oil of *Mustelus vulgaris*) and the burning point from 225° (oil of *Gadus morrhua*) to 352° (oil of *Macrorhinus leoninus*), the flash points being somewhat lower than, and the burning points approx. the same as, those of vegetable oils. The viscosity at 25° is in all cases above 2.5° Engler and in some cases it is very high; at 56° it is less than 4° Engler, and at 100° in most cases it is less than 1.7° Engler. A. Papineau-Couture

Utilization of marine animal oils in motors. Henri Marcelet. *Chimie et industrie* **Special No.,** 532-3(April, 1928).—See Lumet and M., *C. A.* **21,** 3727. A. Papineau-Couture

Coal and coke. R. W. Morris. *Mineral Ind.* **36,** 81-111(1927).—A review of the industry in the U. S. and foreign countries. A. B.

Some physicochemical properties of coal. F. M. Lea. Building Research Sta., Garston, Watford. *Fuel in Science & Practice* **7,** 430-43(1928).—The following properties of 35 coals were studied: the sorptive powers for H_2O and certain dyestuffs, the linear expansion of dry coal on wetting and the sorption of O_2. The results of a large no. of tests are given in 13 tables. The rate and amt. of sorption of moisture by coals from a satd. atm. are a characteristic property of a coal. This property runs parallel to the O content of coals in which this content is less than 10% but does not exist with coals of higher O content. The sorption of dyes by coals depends primarily on the coal and secondarily on the nature of the dye. Dye sorption is hydrolytic in type. There is no definite relation between the sorption of dyes by coal and that of moisture of O. The amts. of O absorbed at N. T. P. increases with the coals of higher O content, this relation being especially apparent on mixing the fine coal with $Ca(OH)_2$. The linear

expansion of coals on wetting varies widely with a max. of 2.08%. This expansion is greatest and most quickly reached with those coals of high O content. On a basis of the results obtained the coals are divided into 3 classes; these classes amount to what might be termed high, medium and low O content. The colloidal nature of coal is considered in explanation of the results. D. A. REYNOLDS

Analytical characteristics of coal. W. FUCHS. *Brennstoff-Chem.* **9**, 198–200 (1928).—The OH number of coals varies (analytical data given) from 65.9 in Kassel brown coal to 19.0 in Upper Silesian bituminous coal. For the detn. 1 g. dry coal is heated (water bath) with 50 cm. 0.1 *N* alc. KOH for 30 min., dild. with EtOH (so that the soln. contains not less than 75% EtOH at the end of titration) and titrated with 0.1 *N* H_2SO_4, with phenolphthalein. J. D. DAVIS

The composition of coal in relation to spontaneous combustion. WILFRID FRANCIS. U. S. Bur. Mines with the Brit. Safety in Mines Research Board. *Proc. Am. Gas. Assoc.* **1927**, 1392–8.—The various plant products contributing to the formation of the org. substance of coal fall into 2 groups according to their resistance to decay, (1) spore exines and cuticular tissues, and (2) resins. During the decay of a deposit of plant remains, the spore exines, cuticles and resins remain practically unchanged but the woody parts decomp. and eventually the *ulmins* are formed; these are defined as brown amorphous products of vegetable decay, which are usually sol. in alkalies. Ulminification is the main chem. process during the decay of plants. The ulmins are the most easily oxidized of all the ingredients of coal; the spore exines, cuticles, and hydrocarbons are very resistant, and at low temps. the resins are slow to oxidize. The changes in compn. of the ulmins which cause the reduction in danger from spontaneous combustion are those of condensation, dehydration and possibly polymerization. Comparative detns. of the rates with which the ulmins of various coals will oxidize may be used as a measure of their liability to spontaneous combustion. At present these values are being obtained by actually measuring the vols. of O_2 consumed during the oxidation of known wts. of the coal under standard conditions It is hoped that a chem. oxidizing agent may be used. The inert ingredients of coal, the *vitrain* bands, are easily reduced to powder by ordinary handling, which increases the rate of oxidation of coal, chiefly on account of the increased surface formed. *Durain* is safe from oxidation, while *clarain* is intermediate in danger between the vitrain and durain. Mother of coal, or *fusain*, contg. as little as 30% ulmin, is easily oxidized, even at low temps., and excessive local heating may easily occur. This material, however, is a minor constituent of coal. J. H. PERRY

How composition affects burning qualities of coal. A. A. POTTER AND H. L. SOLBERG. Purdue Univ. *Power* **68**, 183–6(1928).—A general discussion of the influence on burning qualities of H_2O, O, S, N and clinkering properties. D. B. DILL

The mineral constituents of lump coal. R. LESSING. *Z. Oberschles. Berg- u. Hüttenmänn. Ver. Katowice*, No. **4**, separate 7pp.(1928); cf. *C. A.* **21**, 2370.—The difference between ash and mineral contents of coal is explained and, on the basis of their probable sources, the mineral constituents of coal are classified into 6 groups. The av. ash contents of the components of English coals, clarain, vitrain, durain and fusain, are: 1–2, 1, 6–7 and 15%, resp. Complete quant. analyses of the H_2O-sol., the acid-sol. and the insol. portions of the ash from each of the 4 components are tabulated. The results are interpreted in terms of the minerals originally present in, and their influence on the characteristics of each portion of the coal. No homogeneity was found in the ash content of coals, but its chem. compn. dets. the heat-resistance of the ash. The importance of compn. and quantity of ash in coals in their uses for power generation and coke and gas production is discussed. It is estd. that approx. 25,000,000 tons of coal ash is produced per annum in Great Britain and the economic losses incident to the handling and transportation of this useless material emphasizes the need for clean coal. The effects of inorg. constituents in coal on its coking and gas-producing qualities are outlined. The data from many expts. to det. the catalytic effects of added amts. of certain inorg. compds. on the coking properties of sugar, cellulose and coal are given in 3 tables. The results are discussed in relation to their practical application in the coal-carbonization industries. A bibliography of the author's publications on this subject is given. W. W. HODGE

Investigation of the microbiology of coals in the seam. R. LIESKE AND E. HOFMANN. *Brennstoff-Chem.* **9**, 282–5(1928); cf. *C. A.* **22**, 4417.—Samples were taken from several bituminous coal mines of the Ruhr district, extreme care being taken to use sterile app. for sampling to avoid contamination. The coal beds were sampled at depths of 400 to 750 m. and samples of mine water and mine air were also taken. The mine water was seldom sterile and the air always contained bacteria, the number of which

did not vary greatly in outgoing and incoming air. In some entries iron bacteria and S bacteria (*Thiothrix*) were found. It was learned that the over burden, even at great depths, was not sterile. Bacteria were almost always found in the coal beds themselves. These belonged mostly to the subtilis and particularly the mesentricus group. Frequently cocci were found. Fungi were found in the mine air and in old workings but not in the unexposed coal bed. Coal bacteria were found not to be pathogenetic. J. D. DAVIS

The classification of coal. SAMUEL W. PARR. Univ. Illinois Eng. Expt. Sta., *Bull.* No. **180,** 59 pp.(1928).—The growth of the U. S. as a coal-producing nation from 1322 tons (all anthracite) in 1821 to approx. 600,000,000 tons per annum now is noted and an historical sketch of previous works on coal classification is given. The fundamental factors in coal classification, geological changes, O content, volatile matter, inert materials, calorific value and compn. of coal types are discussed. Unit coal is defined as the pure coal substance altogether apart from the extraneous or adventitious material which may have become assocd. with the combustible org. substance of the coal; and the following formulas are developed: non-coal $= 1.08\,A + 22/40\,S$; unit coal $= 1.00 - (1.08\,A + 22/40\,S)$; unit B. t. u. $= \dfrac{\text{indicated B. t. u.} - 5000\,S}{1.00 - (1.08\,A + 22/40\,S)}$, unit volatile $= \dfrac{\text{volatile as detd.}}{1.00} - \dfrac{(0.08 + 0.4\,S)}{(1.08\,A + 0.55\,S)}$, where A = ash as weighed and S is sulfur. The accuracy of the formula for unit coal is verified by calcns. tabulated along with analytical data on float and sink portions of 11 typical coals from widely sepd. localities. Comparative heat values for pure coal substance as calcd. by 3 methods are also tabulated. The Parr system for classification of solid fuels is explained and illustrated with 3 coördinate charts plotting B. t. u. (unit coal) from 9000 to 16,500 against % volatile matter (unit coal). The 1st chart shows the type areas of the system, anthracite (type 1), semi-anthracite, bituminous A, B, C and D, lignite and peat. The cannel (type 9) area is not definitely outlined and wood (type 10) with an av. unit volatile of 70.05% and unit B. t. u. of 8650 is equally distinctive and falls entirely outside the chart's lowest B. t. u. line. The 2nd chart shows the location of type samples of American coals and the 3rd gives the classification of 625 coals from all parts of the U. S. The analytical data, with reference where secured, for these coals and for 150 coals from other countries of the world, together with calcns. of unit B. t. u., unit volatile, the geographical source and Parr classification of each coal are given in 24 tables. Comparisons are made between the Parr, Seyler and Bur. of Mines classifications. A bibliography of the development of methods of classifying coals (111 articles from 1877 to 1927) is included. W. W. HODGE

Astrurian coal occurring in the territory of the Cantabrian Cordilleras. P. KUKUK. *Glückauf* **63,** 821–9; *Chem. Zentr.* **1927,** II, 800.—Data are given on the quality of coal mined in Astruria. It yields 56.5–70.9% coke, 29.0–43.5% volatile matter, and 2.79–13.20% ash. Its calorific value is 4690–6090 kg. cal. Stratigraphical conditions of Spanish carbon are described. J. S. REICHERT

The coal fields of Scotland. The carbonization of "Kinneil gas." C. H. LANDER. Dept. Sci. Ind. Research. *Fuel Research, Phys. Chem. Survey Nat. Coal Resources,* No. **11,** 39 pp.(1928).—The location, geological setting and section drawing are given of the 6-ft. seam of Kinneil gas coal. The physically distinguishable components, vitrain, fusain, durain, cannel lumps, stone inclusions and fire clay, present in the 500-ton "run of mine" shipment of this coal used for the tests are described. The normal coal just floated and all impurities sank in liquids of 1.35 and 1.60 sp. gr., resp.; hence this coal after crushing could be easily cleaned to reduce ash content from 7% to about 4%. The mean proximate analysis of 360 tons of air-dried coal was: moisture 2.3, volatile matter less moisture 33.5, fixed C 57.2, ash 7.0%. The mean ultimate analysis of 175 tons was: ash 7.09, C 78.16, H 4.86, N 1.45, S (combustible) 0.38, difference O and errors 8.06%. The mean C:H ratio was 16.1:1. Results of the Gray-King carbonization assay of the coal at 600° are compared with a similar assay of "Mitchell Main Gas" coal. Fusion pt. detns. on ash from Kinneil coal showed no change except a slight surface glazing in an oxidizing atm. to 1450° and in a reducing atm. to 1375°. With from 40 to 50 tons per run 4 carbonization tests (2 each with 5% and with 10% steam) were made in continuous vertical retorts; and 5 tests in horizontal oval D section retorts using 28 to 50 tons per test. The details of the tests, tables of complete analytical data on coal used, and coke, tar, gas, liquor and $(NH_4)_2SO_4$ obtained in each test are given; also temps. and pressures in the carbonizing systems, yield, wt., and thermal balances, and screening tests of coal used and cokes formed. Kinneil coal worked well

in both types of retorts. Yields obtained by using 5.2% steam in the vertical retorts compared with results in the horizontal retorts were, resp., per ton coal processed: coke 1261 and 1378 lbs.; gas 16,770 and 12,300 cu. ft. of 477 and 574 B. t. u. per cu. ft.; tar 15.0 and 9.4 gals.; $(NH_4)_2SO_4$ 23.4 and 26.6 lb. Three appendices present the results of expts. showing that: (1) Kinneil coal on low-temp. carbonization at 625° produces an excellent smokeless fuel coke; (2) each of the high-temp. cokes and the low-temp. coke were satisfactory for firing a Lancashire boiler; (3) the high-temp. cokes gave good results when used to produce fuel gas in a suction-gas plant and in a producer in a horizontal retort setting, but excessive clinkering occurred in the water-gas plant. Two folded plates give diagrammatic elevation and section drawings of the vertical and the horizontal high-temp. retort installations with their tar and gas-treating equipment as constructed at H. M. Fuel Research Station, Greenwich, Eng.

W. W. HODGE

Resistance of various coals to shock and abrasion. D. J. W. KREULEN. *Brennstoff-Chem.* 9, 264-7(1928).—Several coals of differing rank are tested by methods very similar to those commonly applied to coke in the shatter and tumbler tests. In the shatter test K. uses 2 kg. coal (sized on sieves with round holes between 30 and 40 mm. diam.), which he drops successively from a wood box 1500 cm. on to an iron plate. After each fall the coal is sieved through sieves having 30, 20, 10 and 5 mm. diam. round holes and the wt. of coal passing each is recorded. Results are given by curves showing the relation of no. of falls to each size produced. For the tumbler test a cylindrical, rotating, sheet-iron box 30 cm. diam. × 15 cm. long is used. The charge and size of coal are the same as that above. A test consists in rotating the charge 60 times at 60 r. p. m., sieving as above, and repeating the operation. Results are shown by curves giving the relation of weights of sizes produced to number of rotations. The curves are very similar to those of the shatter test. A young Welch coal tested resisted abrasion better than shock. This was a very hard coal, which tended to split on falling but because of its hardness did not abrade readily. Resistance to shatter and to abrasion often varies inversely with rank of coal. This explains why some young coals (intrinsically sensitive) prove less sensitive to spontaneous heating than older coals; their oxidation is retarded by absence of fine coal normally produced on handling.

J. D. DAVIS

Hydrogenation of coal in the presence of catalysts. B. HLAVICA. *Brennstoff-Chem.* 9, 229-31(1928).—Five different coals ranging from 71 to 86% C (basis of coal substance) were hydrogenated dry in a 1.8-l. rotating autoclave at temps. of 430° to 470° with initial pressures of 65 to 110 atm. Oxides and chlorides of the following metals were tested as catalysts and their efficiencies compared with Fe_2O_3 recommended by Bergius: Zn, Al, Co, Cu, Ni, K, Ca and Sn. Relative efficiency of some of the best catalysts (compared with Fe_2O_3 taken as 1) was: $Fe_2O_3 + ZnCl_2$ 1.43, $Co_2O_3 + CuO$ 1.65, $NiCl_2$ 1.7, CuCl 1.95, ZnO + KOH 1.7. As regards conversion of the coal into oils, the best result was obtained with $NiCl_2$; liquefaction of the coal was practically complete and by far the most of the H_2 used formed liquid and solid products. The amt. of catalyst used was usually 10-20% of the charge. H. considers that hydrogenation proceeds in 3 stages: (1) At 300° to 400° there is rapid absorption of H_2 and deoxidization with H_2O formation and conversion of the coal into an asphalt-like mass; (2) H_2 is still absorbed rapidly and the asphalt mass becomes steadily softer until all the coal is converted; (3) rapid splitting of mols. takes place with formation of gases and low-boiling oils. J. D. DAVIS

The agglutinating value of American coals. W. H. FULWEILER AND T. K. CLEVELAND. U. G. I. Contracting Co. Lab., Philadelphia. *Proc. Am. Gas Assocn.* **1927**, 1399-1410.—The proximate analysis of a coal does not indicate its coking qualities or agglutinating value. A coal contg. the highest proportion of agglutinant (β and γ compds.) does not necessarily form the best coke under ordinary conditions of carbonization. A review is given of the lab. methods for detg. the coking power of coals, which lead up to Barash's method (*Gas J.* Special No., Nov. 9, 1925). B.'s method was used to det. the agglutinating values of 72 U. S. coals (from the Va., W. Va., Pa., Ky., Ala., Ill., districts and from one English district). No direct correlation of the agglutinating value and the amt. of volatile matter present is possible. If the coals are classified according to the location of thir resp. seams, it is found that the Ky. coals fall within a fairly small area of the plot indicating a high-volatile matter concn. with a correspondingly low agglutinating value. With the Va. coals, a regular increase in the volatile matter concn. is accompanied by an increase of the agglutinating value. The W. Va. coals show no regularity, while those from Pa. are similar to the Ky. coals. The coking test described by Barash was applied to several of the coals. Those having

an agglutinating value of 1:15 or less gave a dense coke with little swelling; while those with an index above 1:15 usually gave a porous coke accompanied by extensive swelling. An exception to this rule is an Ill. coal, having an index of 1:22, which gave a dense, hard coke with little or no swelling. A definite relation between the agglutinating value of a coal and its relative operating efficiency in a water-gas generator seems possible. J. H. PERRY

The drying of coal. FELIX BRAUNEIS. *Montan Rundschau* **20,** 430–3(1928).—The drying of coal is desirable because it reduces freight charges and makes the coal more suitable for use. If half the 300,000 cars of brown coals mined per annum in Austria are shipped it means the transporting of 70,000 carloads of water and 15,000 carloads of clayey materials. Practical drying involves the removal of free, but not of hygroscopic water and must be carefully controlled, diffusion of moisture from the interior of the coal keeping pace with evapn. from the surface, or cracking and crumbling of the coal results. Under favorable conditions air-drying reduces the H_2O content of raw brown coal from 50% to 25%, but climatic conditions are uncertain. Artificial methods of drying mentioned are: with steam direct and indirect, industrial gases, air or electricity passed through the coal, or electric osmosis. The use of steam, direct contact and of hot gas streams are the most important methods for drying coal. These 2 methods are discussed at length from the standpoint of the physics involved; capillarity of the coal, diffusion, surface tension and vaporization, heat transfers, elasticity of the coal cells, size of coal particles, time rates and temp. differentials best to use. Calcns. given show thermal and fuel requirements for drying a brown coal of 36 and 15% moisture. Calcd. increase in heating value by reduction of H_2O content of coal is 30%; by reducing both H_2O and ash the increase is 40% in calorific value. By drying and purifying the medium-grade Austrian brown coals the quantity of coal imported could be reduced. W. W. HODGE

The dry cleaning of coal. A. N. HARRISON SLADE. Univ. of Birmingham. *Trans. Inst. Mining Eng.* **75,** 136–53(1928).—Appliances for dry-cleaning coal date back to 1850. The first modern type of successful pneumatic sepn. was developed by Sutton and Steel in the U. S. A. (1905). The Birtley "Wye" separator uses a reciprocating inclined table, the bed of which is perforated and covered with riffles. The raw coal is fed on the table and air passing through the bed renders the coal bouyant and brings about stratification. The shale is trapped in the riffles and the clean coal travels across the table. Lab. tests have shown a max. efficiency of 86.5%. C. W. O.

Recent progress in the technic of coal washing. CHARLES BERTHELOT. *Rev. ind. min.* **1928,** No. 178, 203–27.—The washing of slimes and dust, either in special rheolaveurs or in flotation app., assures a net increase of 10 francs per ton for these products. In order to reduce the ash content of the fines and slimes or float dust, it is necessary to drain them, wash them in clean water and deliver them *directly* into the bucket conveyor which then carries them to the washed fines. The system of methodically decanting the wash water and then cleaning it by flotation appears to hold much promise of success in that it appears to give a means of avoiding pptn. of clay in the fines. Eliminating part of this clay will reduce the ash in the washed coal. Coal washing has now been reduced to a science resting on definite laws of physics and chemistry. C. W. OWINGS

Clean coal in the coking industry. R. LESSING. *Gas World* **88,** Coking Sect., 58–62(1928).—Considerable errors are introduced, in the study of coal, by failure to distinguish between ash and the mineral matter present in the coal, because of changes during ignition, such as loss of CO_2 from carbonates, dehydration, oxidation, etc. Ash compn. and content, and their variation with particle size in graded specimens, are characteristic for the various coal components and are assocd. with their role in coal formation. Thus, the largely water- and acid-sol. ashes of clarain and vitrain represent original plant ash. The ash of fusain is derived from carbonates, etc., diffused by water into the decaying vegetable matter. This is assocd. with its segregation in cracks in the coal seams. Durain ash corresponds to clay in compn. Ash, in graded specimens, decreases in clarain, is uniform in durain and increases in dirt with decrease in size. Of 10% ash in coke, representing about 7% in the coal, all but 1–1.5% comes from dirt. It reduces the strength of the coke and produces breeze. F. S. G.

Bituminous coals of the Plauen District near Dresden. F. FOERSTER AND A. LANDGRAF. *Brennstoff-Chem.* **9,** 169–74(1928).—Five samples representing three beds of this region were analyzed and assayed for low-temp. carbonization yields. Forms of S and their behavior on burning were detd. and R, the pure coal substance, was calcd. from the results and from the ultimate analysis by the formula: $R = 100 - (a - 2.5b + 2.5c + 5/8d + f)$. Here, a = % ash detd., b = SO_4 sulfur in ash as

% of original coal, c = SO_4 sulfur in coal, d = pyrite S in coal and f = moisture in coal. The C in pure coal as derived by the formula was near 84%, the limit set by Bergius for normal coalification; *i. e.*, coalification under conditions of moderate temp. and pressure. J. D. DAVIS

The physical constitution of bituminous coal and coal seams. JOHN G. KELLETT. *Trans. Inst. Mining Eng.* 75, 400–12(1928).—Bituminous coal of Carboniferous Age when examd. macroscopically is seen to consist of fusain, vitrain and durain. These constituents may occur as sep. lenticles, but much of the coal seam consists of fine intercalations of these constituents. Often the naked eye cannot distinguish the sep. components. The so-called bright coal is termed clarain. The microscopic constituents of coal are anthraxylon, residuum, microspore and macrospore exines, resins, rodlets, cuticles and fusain. The relation between the microscopic and macroscopic components of coal has been shown to be: (*a*) vitrain is composed of anthraxylon; (*b*) durain is microscopically complex, consisting mainly of exines, resins, cuticles and residuum; (*c*) clarain is distinguished from durain by progressive addn. of anthraxylon; (*d*) the brightness of the coal is proportionate to the content of anthraxylon. C. W. OWINGS

The distribution of ash in bituminous coal seams. JOHN G. KELLETT. *Trans. Inst. Mining Eng.* 75, 413–20(1928).—The application of the petrological microscope to the study of residual ash affords a quick and accurate method of detg. the principal constituents. A microscopic study of the residual ashes from vitrain, fusain and durain has largely confirmed the deductions of Lessing (*Trans. Inst. Min. Eng.* 60, 288(1920-1921); cf. *C. A.* 14, 1888, 1889). From the point of view of coal cleaning it is of interest to note that vitrain cannot be sepd. from its ash (this amounts to less than 1%); durain carrying clay finely disseminated through its mass, amounting to 6%, cannot reasonably be cleaned; this also applies to clarain carrying vitrain ash and fine clay, and to fusain carrying typical "fusain ash." By means of a microscopic examn. it is possible to det. the constituents of any coal ash in terms of the earthy vitrain ash, the kaolinite rods of fusain ash, clay, ankerite, and pyrite residues. The principal ash constituent in coal is generally clay, usually in bands. Colloidal clay is occasionally found in fusain. C. W. OWINGS

The influence of bitumens extracted from coal with tetralin under pressure on its coking properties. E. BERL AND H. SCHILDWÄCHTER. *Brennstoff-Chem.* 9, 121–2 (1928).—200 g. coal is extd. repeatedly with 500 cc. tetralin in an autoclave at 250°. The exhausted residue is extd. with EtOH until free from tetralin. The ext., free from tetralin, is sepd. into oily and solid bitumen according to Fischer (*C. A.* 19, 717, 1767) by soln. of the former in petroleum ether. On mixing back the sepd. bitumens with the extd. residue and coking, it was found that solid bitumens promote swelling and oil bitumens cause coke cementation (agreement with Fischer); however the degree of swelling and of coking of the original coal was not at all closely simulated when the mixts. were used. J. D. DAVIS

The fundamentals of coal blending and the production of solid smokeless domestic fuel. J. G. KING. *Gas J.* 183, 668–70(1928).—A general discussion. F. S. G.

Progress in central-station use of pulverized coal. E. H. TENNEY. *Mech. Eng.* 50, 767–73(1928). E. J. CRANE

Powdered coal or grate firing? N. F. NISSEN. *Arch. Wärmewirt.* 9, 55–8(1928).—A defense of grates. ERNEST W. THIELE

Automatic grate firing and clinkering. HANS LANGER. *Arch. Wärmewirt.* 6, 273–5(1925).—The *Pastrnák stoker* is described. When fuel is to be added, a long car running on rails shoves the fuel on the grate toward the door, and deposits fresh fuel on the back of the grate. Test results in a cellulose plant are given. E. W. T.

Results with the new "turbine" grate. ANON. *Arch. Wärmewirt.* 6, 299–301 (1925).—This is a fixed grate, for forced draft by steam injector, intended for fines and low-grade fuels. The cast-Fe grate sections fit together to form nozzles similar to those in a turbine. A number of boiler test results are given. E. W. T.

Flow resistance of powdered coal in air or other viscous fluids. WILHELM NUSSELT. *Arch. Wärmewirt.* 6, 61–3(1925).—The formulas for the velocity of fall of a coal particle given by Audibert (*C. A.* 16, 1850) and Blizard (*C. A.* 18, 3509) are incorrect. If r is the particle radius, W its velocity, and S and s are the densities of the particle and the fluid, respectively, then rS/W^2s is an arbitrary function of Reynold's modulus. This, however, does not check A.'s data. ERNEST W. THIELE

The Brand system of burning pulverized coal. ANON. *Engineer* 146, 321–2 (1928).—Details are given of two tests carried out on a Scotch boiler equipped with

the *Brand* system of burning pulverized coal. The pre-furnace maintains the temp. of the furnace at any desired point, either fusing or not fusing the ash, and also keeps down dust. The walls of the pre-furnace must be water-cooled or else lined with bricks of high Si-Al content. D. B. DILL

Burning crushed coal in suspension. JOHN F. O. STRATTON. *Power* **68**, 486–7 (1928).—Coal crushed to $^1/_4$ in. size is fed through a nozzle at the side of the furnace. Finer particles are burned immediately and larger particles fall on a reciprocating grate. The resulting coke and ash are fed by the grate to an upward nozzle through which pre-heated air passes at a velocity of 2530 ft. per min. Non-combustibles liquefy, forming dense particles, which fall into the ash pit. D. B. DILL

Plant hazards in the preparation and firing of powdered coal. FR. SCHULTE. *Arch. Wärmewirt.* **9**, 107–10(1928).—The regulations of the German coal commission on this subject are presented and discussed. ERNEST W. THIELE

The question of separating ash from powdered coal. H. W. GONELL. Staatl. Materialprüfungsamt, Berlin-Dahlem. *Arch. Wärmewirt.* **9**, 209–12(1928).—Tests on *air sepn.* were made in a glass lab. app. An artificial mixt. of powd. slag and coal could be sepd. fairly well after sieving; with a natural coal only the pyrite was removed. ERNEST W. THIELE

The carbonization of pulverized coal by the Bartling process. DAVID BROWNLIE. *Gas Age-Record* **62**, 442–4(1928).—The Bartling process uses pulverized fuel of the ordinary degree of fineness, that is about 90% through a 100-mesh screen and 60% through a 200-mesh screen. The main difficulty with such a process has been the sepn. of the carbonized coal dust from the conveying medium, generally recycled gas or steam. The Bartling process solves this difficulty by using the new "*Coriolis*" *separator*, which consists essentially of 2 flat steel disks, spaced about 2 mm. apart. One of the disks is stationary, while the other revolves at a peripheral speed of about 230 ft. per min. If the gas-dust mixt. is passed between the disks, the lower one being stationary, the gas next to the stationary disk has little rotary motion while the gas next to the other disk tends to attain the velocity of the disk. It is claimed that all the dust is thrown down by centrifugal force to the lower disk and leaving the disks drops by gravity, while the gas passes out and upward. In the Bartling process the pulverized coal is blown upward through an externally heated, short, cylindrical retort, by residual gas, where it is carbonized by direct contact with the walls and by radiation. It then passes up under the center of a revolving disk, the bottom of the separator acting as the stationary disk, and the gas and dust are sepd. LESLIE B. BRAGG

The burning of coal. K. SCHREBER. *Dinglers Polytech. J.* **342**, 97–102(1927).—By considering the important reactions and their equil. conditions during combustion in a hypothetical simplified fuel bed S. concludes that the coal on the grate at the ordinary grate temps. burns only with the help of the CO_2; only at very high temps. as in a blast furnace does the coal combine directly with O, and then only to CO. On the grate every particle of coal is surrounded with an envelope of CO, at the boundary of the envelope toward the particle the CO_2 changes to CO and on the boundary toward the gas phase the combustion of CO to CO_2 takes place. E. G. MEITER

Low-temperature carbonization of bituminous combustibles. F. H. MARTIN. *Rev. ind. min.* **1928**, No. 185, 359–64.—At the Bosen mine, Fiejus, France, a new type of mech. furnace was developed in 1925, perfectly adapted to treat shale difficult to treat. The shale has a content of 10–58% hydrocarbons, and an av. of 25%; the calorific value is 5091. The production of gas at 500° is 40% less than obtained when the temp. at which distn. is stopped is from 750° to 800°; at the latter temp. the heating value is 9850 cal. The Bosen installation consists of 6 furnaces grouped in pairs. A furnace consists of a metal part and a refractory masonry part. The metal part consists of a molded steel retort, in the form of 2 horizontal cylinders. In each cylinder is an app. for propulsion and mixing. The original feature is in the construction of cross-shaped (cruciform) shafts, divided into several sections working in a Cardan joint, some sections being fitted with blades carried by sleeves fixed on to the shafts, 4 blades forming a complete spiral. The propellers rotate in opposite directions, each blade being arranged to sweep the space between 2 adjacent blades, thereby preventing fouling of the app. and periodically drawing the material from the center of the retort toward the heated walls. The capacity of a retort is 10 to 12 cu. m. in 24 hrs. The time necessary for complete distn. is about 2 hrs. The normal temp. of distn. is 470° to 500°. The shale is crushed to pieces 0 to 33 mm. in size, the fines constituting about 60% of the charge. Temp. is controlled by elec. pyrometers in each retort. Gas produced by distn. is taken off by tubes, of large cross section, to a general collector, under a negative pressure of 5 mm. of water. The temp. in the combustion chamber is

const. at about 1300°. Heating of the producer has been provided for by means of metallurgical coke, with 79 to 80% free C and 6700 cal. Coke is consumed at the rate of 160–165 kg. per ton of shale distd. The furnaces built by the Soc. de Mines de l'Esterel are adapted for low-temp. carbonization of all bituminous combustibles rich in hydrocarbons and in particular those of glutinous nature for the following reasons: (1) Their continuous method permits treatment of a large tonnage with relatively few units; (2) they are particularly adapted to distil fine material; (3) the absolutely tight retort permits rational distn. without polymerization or pyrogenation of gaseous products; (4) all the hydrocarbons contained in the ore can be obtained with a max. of light fractions; (5) the propulsion and mixing app. while preventing the agglomeration of the matter, puts it in frequent contact with the heated walls of the retort and facilitates the liberation of gas; (6) all parts are interchangeable; (7) finally the construction of the furnaces themselves, with alternate means of operation, by stopping and putting back into operation, has made it possible to obtain highly satisfactory results. C. W. Owings

The Dvorkovitz process of low-temperature carbonization. David Brownlie. *Gas Age-Record* **62**, 354–6(1928).—An exptl. plant at Slough, near London, consisting of 2 retorts, each with a throughput of 5 tons of coal per 24 hrs., is described. The retorts are both internally and externally heated with producer gas. Yields of 30 gal. of low-temp. tar per ton and 75% of smokeless fuel, contg. less than 10% volatile matter from av. bituminous coal are claimed. On distn., 4 gal. of gasoline, 12 gal. of kerosene, 6 gal. of lubricating oil, 24 lb. of paraffin wax, 40 lb. of phenols, 90 lb. of residual pitch and 24 lb. of sulfate of ammonia are said to be obtained from the 30 gal. of tar. Leslie B. Bragg

The Plassmann process of low-temperature carbonization. David Brownlie. *Gas Age-Record* **62**, 196–8(1928).—The Plassmann retort is carefully described. It is an ingenious, mechanically continuous retort for the carbonization of bituminous coal dust and fines. From swelling coals, in consequence of the confinement and compression of the coal, large-sized pieces of coke are produced containing 8–12% volatile matter. A retort having a capacity of 50 tons of coal per 24 hrs. is now in operation at Essen, Germany. Leslie B. Bragg

The Lurgi carbonization process. F. A. Oetken and O. Hubmann. *Montan. Rundschau* **20**, 425–30(1928).—The Lurgi process of coking coals by a stream of hot gas passing directly through the ground coal merits attention because of its special value in carbonizing the younger fuels—lignites, cannels, torbanite, bituminous shales and peat. A description and schematic elevation drawing of a Lurgi installation are given. The fuel works down through a vertical retort structure composed of 3 directly connected chambers designated as drying, carbonizing and coke-cooling zones. Heating of the 2 upper zones is accomplished by circulating through them a portion of the hot circulating gas produced and when needed to maintain the desired temp. a portion of the gas is burned in heating ovens around zones 1 and 2. Advantages claimed for the Lurgi process are: large capacity of ovens, accurate control of working temps. from 450–500° for low- to 1000° for high-temp. carbonization, favorable heat exchange allowing a large throughput, simple, reliable and reasonable-priced construction, and sep. drying and carbonization of the fuel. Pictures are given of 2 plants constructed to process 120, and 500 tons/24 hrs. of brown coal; also of 25, and 360 tons/24 hrs. lignite plants. Results obtained in the 25t/24 hr. lignite and the 120t/24 hr. brown coal plants, of Al-retort carbonization assays, and analyses and properties of fuels used, the tar, light oil, and pitch and semi-coke produced are tabulated. Additional gas is needed if the material being carbonized contains over 45% water. 70 h. p. for mech. work and 3 shifts of 15 men are required to operate the 120t/24 hr. plant. The products obtained depend on the properties and kind of fuel being carbonized, but plant operations can be varied to produce more oil and tars or for more semi-coke or for av. yields of both kinds of products. W. W. Hodge

Combustion studies. Fritz Schuster. *Feuerungstech.* **16**, 54–6(1928).—S. presents a table whereby the O_2 corresponding to any given CO_2 content in the flue gas can be more readily calcd. Ernest W. Thiele

The automatic control of combustion for steam boilers. Heinrich Treitel. *Arch. Wärmewirt.* **9**, 249–55(1928).—T. discusses the possible arrangements for regulating fuel, air and water when the boiler load varies, and the requirements to be fulfilled by a control system. He describes briefly the Bailey, Smoot and Roučka systems, and then at length the *AEG-Askania control* for powd.-coal boilers. The line pressure regulates the coal flow; the coal flow regulates the air, which is corrected by the flue-gas CO_2. The furnace draft and the water level are separately regulated. The regulating element is a light pivoted arm delivering a jet of oil. The position of the arm

directs the jet into one of two holes, which lead to opposite ends of a cylinder. The piston accordingly moves with the arm. ERNEST W. THIELE

The reactivity of combustibles. Method of measurement of velocity of the propagation of the combustion. CH. QUILLARD. *Compt. rend.* **187**, 122–4(1928).—Under well regulated conditions the velocity of propagation for several fuels has been detd. Under-given conditions the rate of propagation in cm. per min. has been detd. for chips of wood, 0.60; anthracite, 0.75; charcoal from sugar, 1.60; semi-coke, 1.15; carbonite, 1.70; wood charcoal, 2.2 to 3.2. L. D. R.

Recent work on the petrology of brown coal. I. H. BODE. *Braunkohle* **27**, 459–64(1928).—A specimen from the Cologne district was investigated by general methods described. The usual disorganized ground mass, with inclusions of wood fragments, periderm, epidermis, spores, pollen, etc., was found, indicating thorough disorganization by atmospheric and other agencies before burial, the Gothan dry peat theory. Remains of wood-destroying fungi were found. F. S. GRANGER

Utilization of brown coals and bogheads of Irkutsk area, Siberia. V. I. MINAEV. *J. Chem. Ind.* (*Moscow*) **5**, 694–7(1928).—The value of the boghead and the brown coal deposits which are at about 200 km. from Irkutsk consists chiefly in the primary tar which can be obtained from them by distg. at 450–500° without access of air. The tar content of the coals is 25–30%, the residual coke being only 11.64%; the ash content of the coals is very high (27.7%). The primary tar, when free from secondary decompn. products, is a liquid bitumen contg. a high % of high-mol. satd. hydrocarbons very suitable for the *manuf. of viscous lubricating oils.* These deposits are not yet mined; if developed, they might yield 150,000 tons of mineral oils annually for 100 years. BERNARD NELSON

The problems of brown-coal distillation. P. ROSIN. *Brennstoff-Chem.* **9**, 182–4 (1928).—In 1926 441,000 tons of brown-coal coke was produced in Germany and this was mostly used for household heating, satisfying the demand for that purpose. In 1928 700,000 tons of coke has been produced and the problem of industrial utilization of the 300,000 tons excess now confronts the mfrs. With the increase in amt. of coal distd. other problems arise, such as: disposal of the poisonous distn. water, economic degree of pre-drying, utilization of dusty rotary-oven tars and economic utilization of distn. gas. J. D. DAVIS

Pressure hydrogenation of an Eozäu brown coal. J. VARGA. *Brennstoff-Chem.* **9**, 277–92(1928).—The coal (1.1% H_2O content and 9.05% low-temp. tar yield) was hydrogenated in a 3.73-l. bomb at 75, 100, and 125 atm. and 450 to 480°. Weights of samples were 300, 400 and 500 g. and heating time at the test temp. varied from 1 min. to 3 hrs. Because of the high S content of the coal (3.98%) 15% Fe_2O_3 was mixed with the coal, by which a S-free gas and oil contg. only 0.22% S were obtained. The Fe_2O_3 works not only as a desulfurizer but as a catalyzer; 5% suffices for the latter purpose, its function being to lower the temp. at which optimum H_2 absorption takes place. The coal yielded 16.8 to 57.9% oil of 1.002 to 1.066 sp. gr., the largest yield being obtained with heating time of 1 min. (after the test temp. was obtained). Longer heating cracked the oil, giving a smaller yield of lower boiling oil. The relative amt. of H_2 the temp., and heating time influence not only the amt. but also the properties of oils obtained. With 500 g. sample and 100 atm. initial pressure heating to 480° gave an oil yield of 52%. The best yield (57.9%) was obtained with 300 g. sample heated to 470° with 100 atm. initial pressure. J. D. DAVIS

Microstructure of New Zealand lignites. II. Lignites subjected to the influence of igneous intrusion. W. P. EVANS. *Fuel in Science & Practice* **7**, 402–7; *New Zealand J. Sci. Techn.* **9**, 339(1928); cf. *C. A.* **22**, 1305.—The various seams of the area studied (Broken River) were largely made up from small fragments of coniferous wood together with smaller quantities of leaves, stems and moss-like plants. This coal-forming mass appears to have been deposited in still water at some distance from the source of vegetation. The wood exhibits a closer relationship to *Taxus* than that shown by any living N. Z. taxads. Spores are rare. The mineral matter is partly distributed evenly throughout the coal mass and partly deposited in fissures. The large quantity of S carried by the unaltered lignite is chiefly org. D. A. REYNOLDS

Drying, carbonization and distillation of peat. CHARLES A. ROUX. *Mon. produits chim.* **9**, No. 90, 8–12; *Chem. Zentr.* **1927**, II, 768.—The equipment and procedure are described for the complete working up of peats of every sort from its removal from the bog to the prepn. of *coke, tar oils, paraffin, pitch, NH_3* etc. with the utilization of all by-products. J. S. REICHERT

Examination of decayed oak. Remarks on the Fischer-Schrader coalification theory. A. BRANDL. *Brennstoff-Chem.* **9**, 89–94(1928).—Oak mold is subjected to the

alkali-acid extn. analysis of S. Odén (*C. A.* **20**, 3342) and also to the acetyl bromide-HCl extn. method of Karrer (*C. A.* **18**, 80). The last method gave: Hydrolyzable matter 25.99% (of this 9.3% was cellulose), lignin and lignin acids 36.72% and humic acids 37.29%. The 2 methods gave closely agreeing results. Ultimate analyses are made and groups COOH and OCH_3 are detd. Results indicate the predominance of lignin either as such or as its solid decompn. products (humic substances). Cellulosic matter seems to have been converted by fungi and bacteria into gases and H_2O-sol. decompn. products which cannot have contributed materially to the solid matter of coal. J. D. Davis

Some technical and economic aspects of the by-product ammonia recovery problem. P. Parrish. *Gas J.* **183**, 677–9(1928).—The production of a concd. gas or sulfate liquor for transport to a central plant, within a radius of 40 miles, for final treatment, is advocated. Disadvantages of the so-called direct and semi-direct processes, in which aq. condensation, before the saturator, is prevented or minimized, are pointed out. Prominent among these are corrosion from HCl liberated by carrying NH_4Cl over into the saturator, diln. of the bath and unsatisfactory nature of the tar. The large no. of operations involved in the anhydrite process, in which $CaSO_4$ is used as a source of SO_3, are not generally realized, and feasibility of this process is largely dependent upon geographical position with reference to anhydrite mines and upon the scale of operations. The utilization of the $CaSO_4$, resulting from treatment of phosphate rock, instead of anhydrite, is deemed worthy of study. Also in *Chem. Age* (London) **19**, 280–2(1928). F. S. Granger

Gasification of steam-dried Köflacher coal in rotating-grate generators. Ludwig A. Richter. *Braunkohle* **27**, 850–7(1928).—Steam-dried lignitic coal, such as the Köflacher coal, as opposed to raw coal as well as to geologically older coals, presents great advantages for gasification purposes. This results primarily from the favorable compn. of the gas, with a calorific value of 1500–1550 kg.-cal. for the water-free and tar-free gas and 1650–1700 kg.-cal. for dry tar-contg. gas. This gas compn. is brought about by the high reactivity of the coal substance, as a result of which the decompn. of the steam takes place to a greater extent, and by a higher content of volatile constituents. Further advantages are the favorable nature of the ash and the low S content. The m. p. of the ash is rather high, namely 1280–1300°. Clinker formation, therefore, does not enter in and less steam is required. The water content is, as a result of the drying and the increased steam decompn., lower than with other coals. There are no tendencies toward caking or falling to pieces at high temp., so coking of any kind can be dispensed with. Top fire and periphery fire also cannot occur, for the same reason. The favorable properties of the cinders and of the coal make it possible to work with a deeper ash and coal bed, resulting in small loss from unconsumed coal in the ashes and lower gas temps. Both circumstances unite with the favorable gas compn. in raising the efficiency. The steam generated by the coal itself, in drying, may be utilized for gasifying it. The capacity of the generator is extraordinarily high, corresponding to 1.8×10^6 kg.-cal. of coal heat or 350 kg. of coal per sq. m. cross section per hr. This combines with the elimination of coking, the small ash work and the high efficiency to cheapen the installation, operating and labor costs in using dried coal. Because of the high ash m. p. and low S content, the coal is adapted as a mixing coal to meet the difficulties due to clinker and gas S content in metallurgical firing. The argument is supported by practical data. F. S. Granger

The complete gasification of coal for town's gas. Morris Travers. *J. Soc. Chem. Ind.* **47**, 203–10T, 213–9T(1928); cf. *C. A.* **18**, 161; **19**, 1044, 3157.—The principles on which this complete coal-gasification system operates is explained by comparing it with the gas producer, and contrasting it with the water-gas plant operated with bituminous coal. Descriptions, diagrammatic drawings, and methods of operation are given of a simply modified water-gas generator, of the first plant erected (capacity 250,000 cu. ft. of 350 B. t. u. gas/24 hrs.) for the complete gasification of coal, and of the new plant built to produce up to 1,000,000 cu. ft./24 hrs. including carbureting gas to increase its thermal value to 400 B. t. u./cu. ft. The chem. reactions, thermal analyses and theories of the different systems are discussed. The difficulties encountered in operation and in design especially in going from the 250,000 to the 1,000,000 cu. ft./24-hr. plant are described, also the means employed to secure smooth working and full output. The results of expts. to det. the effect of size and stirring in using bituminous coal as generator fuel showed an advantage was gained by agitating the top layers of the fuel bed if the coal contained a considerable amt. of small material. Drawings are given of 4 different types of coal stirrers and their relative advantages are outlined. Results of several test runs of the different plants are given. In one

test extending through 8 shifts 53.21 tons of dry coal and 2838 gals. of oil were used to produce 2,605,000 cu. ft. of gas of approx. 445 B. t. u./cu. ft. The coal made 2,406,350 cu. ft. of the total gas vol. and this uncarbureted gas had a calorific value of 363 B. t. u./cu. ft. This is equiv. to 174.2 therms per ton of dry coal with no allowance made for coke recovered from the generator. The essential difference between the complete gasification plant and the water-gas plant resides in the arrangement for heating the coal regeneratively by means of water-gas and the circulation gas. Part of the sensible heat of the water-gas is utilized by passing it through the coal. The steam consumption in one test was rather large. A no. of analyses of the gases produced are tabulated; one example where samples of circulation gas and of carbureted gas were taken simultaneously is resp., CO_2 4.6%, 3.1%; CO 32.6%, 32.1%; CH_4 7.9%, 14.4%; C_mH_n 0.6%, 5.1%; H_2 47.8%, 39.7%; N_2 6.5%, 5.6%; calorific value 362.4, 507.4 B. t. u./cu. ft. Several thermal calcns. are given and data obtained from the large plant at Harrow indicate that carbonization in the complete gasification plant operates economically and efficiently. W. W. Hodge

Organic sulfur content of coke-oven gas from coals of widely varying sulfur content. O. P. Brysch and J. F. Byrne. Koppers Co. Lab., Pittsburgh. *Proc. Am. Gas Assoc.* **1927**, 1463–71.—Seven coals and coal mixts. of different S concn. were carbonized in a Becker oven under identical conditions, and the org. S concn. of the gas was detd. by the referee S-app. With 2 exceptions, all showed the org. S of the gas to be approx. directly proportional to the % S in the coal, there being 20 grains of org. S in the gas for each % S in the coal. This direct proportion may possibly not be valid for the carbonization of all types of coals or their mixts. When 2 high-S coals were mixed with Pocahontas coal and carbonized, there were obtained a gas of greatly reduced org.-S concn. and a lower-S coke compared with the results when the coals were carbonized alone. 75–90% of the org. S is evolved at the end of the 8th hr. of the regular 12-hr. coking operation. Pocahontas coal seems to accelerate the evolution of org. S from the high-S coals. The S in the coke (expressed as % of total S in the coal used), possesses the same trend as the org. S in the gas. A S-balance on a mixt. of Kentucky (high volatile) and 20% Pocahontas shows that 59.4% of total S charged is retained by the coke, 1.4% passes over as org. S in the gas, 27.4% as H_2S and 11.8% as S in the tar and NH_3 liquor. J. H. Perry

Gas manufacture. J. W. Cobb. *Gas J.* **183,** 670–1(1928).—A discussion of some current problems from the economic standpoint. F. S. Granger

Device for measuring the rate of flow of gases at the Chemical Research Institute in Warsaw. A. Kaczorowski. Chem. Research Inst. (Warsaw). *Przemysl Chem.* **12,** 294–9(1928).—An app. was assembled for standardizing gas-flow meters for natural gas. A. C. Z.

Specific heat of gases. M. Y. Lourier (Lur'e). *Izvestiya Teplotekh. Inst.* (*Bull. Inst. Fuel Research* (*Russia*)) **1926,** No. 1, 5–31.—Critical review on work done by 82 investigators during the years 1687–1925. A. A. Boehtlingk

Prevention of danger in the operation of gas generators. Kattentidt. *Zentr. Gewerbehyg. Unfallverhüt.* **14,** 202–5; *Chem. Zentr.* **1927,** II, 996.—K. describes a number of devices, as explosion and other safety valves. They are intended to let escape safely into the open air the explosive pressure caused by explosions in the air line of generators operated with compressed air, explosions that frequently occur at a sudden stop of the blast app. on account of backward motion of the gas. Some accidents are described that were caused through the failure of the devices to work, or through carelessness of the laborers. The rare occurrence of a 2nd explosion 10 min. after the 1st one is discussed. G. Schwoch

Laboratory results on the removal of organic sulfur from gas. Norman F. Prince. Rochester Gas and Electric Corp., Rochester, N. Y. *Proc. Am. Gas. Assocn.* **1927,** 1441–52.—Mixed gas purified by passing through 2 wash bottles of 5% Na_2CO_3 and 2 bottles of 5% $CdCl_2$, was passed through 2 or 4 bottles contg. aniline soln., and thence through the tower to remove org. S. The tower (45 in. long and 1 in. in diam.) was filled with glass wool which contained flowers of S. The gas, passing counter-current to the aniline at $^1/_3$ cu. ft./hr., was then passed through 2 bottles of 5% $CdCl_2$, thence through a meter to a Jenkins S app. The results were:

Scrubbing Medium	S in Gas (Grains/100 cu. ft.) Inlet	Exit	% Removal	Temp. °F.
Satd. aniline-H_2O	10.3	9.2	10.7	69
40% NaOH-excess aniline	11.4	6.6	42.1	74
20% NaOH-excess aniline	13.9	3.9	71.2	77
10% NaOH-excess aniline	17.8	7.3	59.0	62

Plain gas oil scrubbing of ordinary mixed gas with a double Bird scrubber (*C. A.* 14, 2254) gave the following results with 3000 cc. fresh gas oil:

S in Mixed Gas (Grains/100 cu. ft.) Inlet	Exit	% Removal	Gas Flow cu. ft./hr.	Time of Run (hrs.)
13.40	6.56	51.04	6.1	1.16
11.82	7.04	40.04	3.8	
11.88	8.43	29.00	5.3	1.50
10.53	8.63	18.00	3.9	1.33
11.92	10.04	15.80	4.2	1.5
11.15	8.76	21.40	4.1	1.33
12.42	11.09	10.70	3.3	1.50

The temp. of each run was 80° F. The following expts. were made with mixts. of 2800 cc. gas oil—5% aniline, 0.5% S and some NaOH, in a double Bird scrubber:

S in Mixed Gas (Grains/100 cu. ft.) Inlet	Exit	% Removal	Time of Run (hrs.)	Gas Flow cu. ft./hr.
11.02	6.82	38.10	1.5	5.6
10.87	5.90	45.70	1.66	2.5
8.66	5.53	36.10	1.50	2.4
11.53	5.81	49.60	1.50	2.3
11.36	6.12	46.10	1.50	2.5
11.36	5.61	50.60	1.50	4.9

The temp. of each run was 80° F. The addition of the aniline, S and NaOH, therefore, gave a more const. rate of S removal. Since this thiocarbanilide reaction results in a better and more uniform S removal, the efficiency of a tower method of scrubbing was studied. The tower was of glass, 48 in. high and 2 in. in diam., and filled with 1/4-in. coke. The oil entered the top of the tower and was recirculated with a pump; the mixed gas entering the bottom of the tower. The scrubbing medium was: 3300 cc. gas oil, 250 cc. aniline, 65 g. S, 10 g. I and some NaOH. The following tests were made:

S in Mixed Gas (Grains/100 cu. ft.) Inlet	Exit	% Removal	Time of Run (hrs.)	Gas Flow cu. ft./hr.	Temp. ° F.
11.56	5.08	56.10	1.25	5.4	77
10.77	4.71	56.30	1.67	5.3	77
10.13	5.07	50.00	1.25	5.8	77
9.64	6.21	35.60	1.42	6.8	77
10.22	5.41	47.10	1.75	5.2	77

Tests made to show the effect of temp. on the scrubbing indicated that an increase of temp. causes a decrease in the S removal. J. H. PERRY

Absorption of sulfur dioxide in the Orsat apparatus. L. K. RAMZIN. *Izvestiya Teplotekh. Inst.* (*Bull. Inst. Fuel Research* (*Russia*)) **1926**, No. 1, 51–5.—R. disagrees with the prevailing opinion that SO_2 gases are dissolved in the condensate obtained from flue gases after cooling down. Only 0.25–2.0% of the total amt. of SO_2 is held by the condensate; the balance enters the Orsat app. and is absorbed by the KOH soln. together with CO_2, giving too high values for the CO_2. A. A. BOEHTLINGK

Résumé of recent literature on carbon disulfide with reference to the gas industry. JOHN C. HOLTZ AND WILBERT J. HUFF. Johns Hopkins Univ. *Proc. Am. Gas Assocn.* **1927**, 1436–9.—References are given to the recent literature concerning: detection and estn. of CS_2; CS_2 in gas making; removal of CS_2; production of CS_2; and the equil. between C and S in the formation of CS_2. J. H. PERRY

The origin and decomposition of carbon disulfide in gas making. II. The carbon-sulfur complex. WILBERT J. HUFF AND JOHN C. HOLTZ. Johns Hopkins Univ., Baltimore, Md. *Proc. Am. Gas Assoc.* **1927**, 1431–5; cf. *C. A.* **22**, 1228.—The formation of CS_2 during oil cracking is of particular interest because the S compds. are probably uniformly dissolved in the remaining oil constituents, thus affording a homogeneous system in contrast to the heterogeneous system in the case of coal previously studied. By feeding a high-S gas oil, into the top of an ordinary quartz cracking tube, at a rate of about 2 cc. per 5 min., the gas was passed through a tar trap and a cotton tar filter tube into a gasometer. The resulting gas sample was then analyzed (cf. *C. A.* **20**, 1508). A cracking temp. of 1200° F. gave too little CS_2 to be detd. in a 2-l. gas sample by the cupric xanthate method; at 1350° F. a definite ppt. was obtained, and at 1800° F. very heavy ppts. were obtained. H_2S may be converted to CS_2 under certain cracking conditions. It is suggested that C surfaces, when exposed to S-contg. gases at

temps. used in gas making, at first absorb S from those gases, which assists in the decompn. of the S compds. The ability to absorb S in this way decreases the exposed C surfaces, satn. is approached and finally CS_2 is evolved. The decrease of the tendency of heated refractory surfaces to decompose S compds. in gas is due not merely to the presence of C upon the surface but rather to the gradual formation of a C-S complex. That C-contg. surfaces free from a complex S condition possess a property similar to that of clean pumice was shown by using a coke cartridge, purged with H_2 at a high temp., in place of the pumice, wherein no CS_2 was found at 1350° F. With continued use, CS_2 ultimately is formed, however. This delay in CS_2 formation cannot be explained by the assumption of external temp. changes, but the delayed formation of the appropriate C-S complex may partly explain the delayed formation of CS_2 over cracking surfaces noted in the operation of carbureted-water-gas plants by Klein (*C. A.* **17**, 1707). With increasing cracking temps., the dissocn. of H_2S and other S-contg. compds. increases, as well as the deposition of C. At higher temps. in gas-making processes it is to be expected that the rate of formation of the C-S complex may be rapid. This would explain the very rapid production of CS_2 from a rapidly formed complex when a S-contg. oil or coal is suddenly thrown on to a very hot surface. The C-S complex plays an important, if not exclusive, part in the formation of CS_2. Conditions favoring the fixation of high local S concn., such as sudden heating with decreased diffusion, reduction of exposed surfaces, and the rapid removal of formed CS_2, also favor the presence of CS_2. Any process giving the gas extended contact with heated surfaces sufficiently low in, or free from S, will decrease the concn. of CS_2 in the gas, or eliminate it entirely. There is at present no evidence to show that CS_2 is produced by a simple reaction between H_2S and C. While S appears to resemble O_2 in forming a complex with C, no exact analog of CO has been isolated. A list of S compds. found in tar oils, with literature references is included.

J. H. Perry

Laboratory apparatus for control of the hydrogen sulfide content of gas. Anon. Municipal Gasworks Utrecht. *Het Gas* **48**, 281(1928).—Gas flows through a glycerol wash bottle and a thermometer capillary on to a continuously moving strip of filter-paper, moistened by a wick with $Pb(OAc)_2$ soln. A continuous record is thus obtained.

B. J. C. van der Hoeven

Connection of the gas, electric and water works of Delmenhorst for fuel economies. Georg Franke. *Arch. Wärmewirt.* **9**, 33–40(1928).—The elec. plant used city or producer gas for the engines, depending on the markets. The water works used gas.

Ernest W. Thiele

An estimation of the accuracy of the Morehead gas apparatus. H. L. Olin and W. G. Ingram. Univ. of Iowa. *Gas Age-Record* **62**, 445–7(1928).—Results obtained by the use of the Morehead app. have been compared with those given by the Burrell-Orsat app. It was found that the values obtained with the Morehead app. were: for CO_2 about 1.1% high, for illuminants 1.8% low, O_2 1.5% high, CO 0.7% low, H_2 7.3% low, CH_4 0.9% high, C_2H_6 no detn., N_2 7.9% high; the above figures are % of total gas and not % error.

Leslie B. Bragg

The use of after-coolers with high-pressure gas compressors. J. E. Cooper. *Gas Age-Record* **62**, 199–200(1928).—The after-cooler installation at the Utica Gas & Electric Co., Utica, N. Y., is described. By cooling the compressed gas to 70° F. in the summer and to 40° F. in the winter they have succeeded in preventing all condensation in the line.

Leslie B. Bragg

The gas smithy of the railroad shops in Arnsberg. Pontani. *Arch. Wärmewirt.* **6**, 105–10(1925).—Cold, clean, brown-coal producer gas is used. The gas and air *recuperators*, of *iron pipe coil*, set in chambers well-protected from furnace radiation, heat the gas and air to 500°.

Ernest W. Thiele

Résumé of work done at the Liévin experimental station from 1912 to 1914 on combustion of gaseous mixtures. G. Le Floch. *Rev. ind. min.* **1928**, No. 175, 143–57.—One of the problems was the *detn. of ignition temp. and the lag of ignition.* Mixts. of gases are introduced into a bottle in an elec. furnace and a photographic manometer photographs the flame while a chronograph records the time. The lag in ignition of H is several seconds but the zone of the long lags is very narrow and limited to several degrees. The lag of ignition of CH_4 for an 8% mixt. is about 0.8 sec. at 700° and 0.1 sec. at 900°; for a 72% mixt. about 6 sec. at 700°; ignition is nearly instantaneous at 1000°. Benzine in a 2% mixt. ignites at 600° in about 0.4 sec. but does not ignite below this temp.; at 800° ignition is nearly instantaneous; a 10% mixt. ignites at 700° in about 1.5 sec.; C_2H_2 ignites at about 540° in from $^1/_2$ to 1 sec. and C_2H_6 in proportions of 4% and 6% ignites in 6 sec.; a 2% mixt. of toluene ignites in about

8 sec. at 600° and in about 0.2 sec. at 800°. These values are taken from charts prepd. from results of tests. A study of variation of the limit of ignition with temp., pressure and compn. of a gaseous mixt. shows that for CH_4 the curve for variation with temp. is a straight line, ranging from 6% CH_4 at 0° temp. to practically 3% CH_4 at 700° temp. The inflammability of CH_4 varies with the content. With about 13.9% O the CH_4 content necessary for ignition is from about 6.2 to 7.7%. The curve is a straight line for ignition from 7.8% CH_4 and 14% O, to 12% CH_4 and 17.5% O. Another subject studied was the *detn. of the rate of combustion of gaseous mixts.* at different temps. At 15° the rate of combustion of CH_4 is 30 cm. per sec. with a 7% mixt., the rate increasing to 70 cm. per sec. at 9.3% CH_4 and then decreasing to 30 cm. per sec. at 11.75% CH_4. The detn. of the rate of combustion allows calcn. of the rate of reaction to corresponding temp. of combustion. Data of tests made on the propagation of the explosive wave in gaseous mixts. are incomplete, as many records were lost during the World War.
C. W. O.

Removal of carbon dioxide from industrial gases with alkali carbonates at normal pressures. F. FISCHER AND P. DILTHEY. *Brennstoff-Chem.* **9**, 138–44(1928).—The feasibility of removal of CO_2 from gases with alkali carbonates is thoroughly investigated. The best results are obtained with hot solns. and these were best regenerated with warm air. The best absorption temp. was 70–80°; that for regeneration was 90–95°. Absorption data are given for various carbonate concentrates, various tower fillings and temps. J. D. DAVIS

Natural gas. K. STOCKFISCH. Prussian State Geol. Inst., Berlin. *Z. angew. Chem.* **41**, 472–5(1928).—S. presents a tabulation of the published analyses of the compn. of natural gas from various sources in Germany, and discusses somewhat the probable origin of the gases high in N_2. G. CALINGAERT

Natural gases. II. Helium content of the natural gases of Poland. KAZIMIERZ KLING AND LECH SUCHOWIAK. Jan Kazimir Univ. Lwow. *Przemysl Chem.* **11**, 209–42 (1927).—Samples drawn from the Carpathian fields of Boryslaw-Tustanowice, Bitkow, Daszawa and Krosno-Jaslo all showed the presence of He, but clearly below 0.05%. Tabulated results indicate that He content of gases of Sub-Carpathian fields increases in the easterly direction. A. C. ZACHLIN

The possible chemical utilization of methane, with special reference to natural gas. A. W. NASH AND H. M. STANLEY. Univ. of Birmingham, Eng. *Fuel in Science & Practice* **7**, 397–401(1928).—In considering the various possibilities of its chem. utilization a survey of the present knowledge of the properties of CH_4 is made. Its chlorination, oxidation, thermal decompn., reaction with steam and conversion into higher hydrocarbons are discussed. The authors believe that the solution of this problem lies within the range of high-pressure and high-temp. reactions, which are now imperfectly known. D. A. REYNOLDS

The purification of coal gas. CHARLES COOPER. *Gas J.* **183**, 671–7(1928).—Detailed review of current industrial practice, with bibliography. F. S. GRANGER

A study of flue-gas analyses. FRED M. REITER. Dayton Power & Light Co. *Gas Age-Record* **62**, 437–8, 452(1928).—The effect of H in the fuel and excess air on flue-gas analyses is discussed. Stoichiometric calcn. of the flue gas, as a means of checking the analysis, and possible errors in sampling and analysis are also considered.
LESLIE B. BRAGG

False readings of flue-gas testers. FICKERT. *Arch. Wärmewirt.* **9**, 124(1928).—In CO_2 meters depending on heat cond., the presence of H_2, due to its high cond., causes an abnormally low CO_2 reading. Such meters cannot be relied on unless means of measuring combustibles are also provided. ERNEST W. THIELE

Basic equations for a complete combustion of flue gases. L. K. RAMZIN. *Izvestiya Teplotekh. Inst.* (*Bull. Inst. Fuel Research* (*Russia*)) **1926**, No. 1, 32–50.—The following calcns. are made: vol. of gases, influence of SO_2, air excess factor, change in vol. on combustion, sp. heat and the heat content of flue gases, av. volumetric sp. heats of flue gases at const. pressure and wt. of flue gases. A. A. BOEHTLINGK

High-grade producer gas from low-grade fuels. RUDOLF CZERNY. *Feuerungstech.* **15**, 337–42(1927).—To increase the heating value and flame temp. of the gas from a poor fuel, part of the gas may be cleaned, heated with a still lower-grade fuel, and introduced into the producer at the lower end of the carbonization zone. Detailed calcns. show that in this way the heating value may be raised from 1386 to 1548 kg. cal. per cu. m., the flame temp. rising 75° or 100°. With a deep fuel bed these figures may be slightly improved. The efficiency is lower by the change, but the use of a cheaper fuel makes the economy about the same. ERNEST W. THIELE

The purification of producer gas. F. BÖSNER. *Z. oesterr. Ver. Gas-Wasserfach.*

68, 139–44(1928).—A description of the elec. pptn. and filtration equipment used for purifying producer gas in the bayrischen und oesterreichischen Vereines von Gas und Wasserfachmännern in Graz. J. H. PERRY

Enameling furnaces with producer-gas firing. G. KÖRRN. *Keram. Rund.* **36**, 221–3(1928).—A construction of gas channels is described which permits removal of tar without interruption of operation of the producer. At the lowest part of the gas channel a sump is provided with one or more pipes of suitable size through which the tar flows to a large reservoir with its bottom at a lower level than the sump. Tar may be removed from the larger reservoir through an opening above. H. INSLEY

The utilization of coke-oven gas by the gas industry. T. P. RIDLEY. *Gas J.* **183**, 659–62(1928).—A general discussion. F. S. GRANGER

The possibilities of vapor-phase oil gas. THOMAS F. HINTZE. Lapp Products Corp. *Gas Age-Record* **62**, 394(1928).—Vapor-phase oil gas is produced by a progressive heat distn., using very high vapor velocities, at times above 40,000 cu ft. per min. The vapor is heated in a heat zone from 230° to 760°, under which conditions benzene and toluene are produced. Low-grade crudes can be converted into gas of 600 to 1500 B. t. u. per cu. ft. LESLIE B. BRAGG

Manufacture of water gas of low specific gravity. LOUIS STEIN AND L. J. WILLIEN. *Chem. Met. Eng.* **34**, 676–7(1927).—By introducing about 1.5 gals. of oil per M into the top of the superheater during the backrun stage of a water-gas set (coke fuel) a 550 B. t. u. water gas was made of sp. gr. 0.50 to 0.55, which could successfully be substituted for straight coke-oven gas (St. Paul). The capacity of the machine was increased 25% over its normal value. This procedure is believed to be of practical value during peak loads. B. J. C. VAN DER HOEVEN

Possibilities of increasing the capacity of producers and water-gas generators. J. GWOSDZ. *Brennstoff-Chem.* **9**, 184–8(1928).—A critic of various proposed methods for increasing capacity; *i. e.*, gasification under pressure, the slagging method, gasification of fine sizes and pulverized fuels. A method involving gasification of fine sizes in rapid motion is being experimented with by the I. G. Farbenind. A.-G. This affects intimate contact of reacting gases with the fuel and holds out promising possibilities. J. D. DAVIS

An investigation of checkerbrick for carbureters of water-gas machines. CULLEN W. PARMELEE, ALBERT E. R. WESTMAN AND WILBUR H. PFEIFFER. Univ. Ill. Eng. Expt. Sta., *Bull.* **179**, 88 pp.(1928).—This investigation covered a study of the phys. and chem. properties of a number of brands of firebrick, the effects of reducing gases, steam and temp. fluctuations on their durability, and the significance of the black cores found in the used bricks. Service tests were also made of samples of each brand in carbureters of different types. The conclusions were that the primary cause of shut-downs was not the failure of the checkerbrick but the deposition of asphalt-like material in the carbureters due to the use of low-grade enriching oils. Under the operating conditions investigated fireclay bricks as a class were unsuited for use in the top courses of carbureters where they quickly fail because of cracking due to stresses set up by the quenching action of the oil on the hot brick. Deposition of C in the pores of the brick, the presence of steam in high concns., surface deterioration due to attack by slag and coke breeze and Fe content of the brick were all found to be minor causes of failure. In general the use of semi-flint clay or the addn. of grog or flint clay improved the service rendered by stiff-mud bricks. A checkerwork consisting of 12 courses of firebrick, 3 courses of bonded SiC brick and 2 courses of heat-resisting alloys would cost 19 times as much as one constructed of firebrick alone but it would last 15 times as long and would probably be more economical because of elimination of shut-downs, decrease of labor costs, and increase in capacity of plant. H. L. OLIN

Reply to the criticism of Hans Tropsch of my paper on the equilibrium conditions for formation of hydrocarbons and alcohols from water gas. D. F. SMITH. *Brennstoff-Chem.* **9**, 248–9(1928).—Polemical, dealing with equil. consts. calcd. by Smith and Tropsch (*C. A.* **21**, 2783; **22**, 3976). Smith's conclusion "at all temps. in increasing measure it is easier to obtain the higher hydrocarbons from water gas" is attacked by T. S. further explains his data and T. adds further comment. **Comment on the foregoing discussion by D. F. Smith.** H. TROPSCH. *Ibid* 250. J. D. DAVIS

New method of naphthalene determination. K. N. CUNDALL. *Gas Age-Record* **62**, 393–4, 402(1928).—The naphthalene is first removed from the gas by the Colman-Smith method of bubbling the gas through picric acid, forming naphthalene picrate. The ppt. is then filtered out and very carefully washed with a 0.20% picric acid soln. The filter paper and ppt. are next dried with a filter pump until all possible wash solution has been removed and the ppt. appears dry. An excess of a soln. made by dissolving

188 g. of KI and 24 g. of KIO_3 in 500 cc. of cold distd. water is added; this breaks down the naphthalene picrate, liberating picric acid, which in turn reacts with the KI and KIO_3 to liberate a quant. amt. of I. The I is titrated with $Na_2S_2O_3$, a 0.1 *N* soln. being used with starch as indicator. One mol. wt. of $Na_2S_2O_3$ corresponds to 1 mol. wt. of naphthalene. The picric acid retained in the ppt. and the filter paper is estd. or detd. by a blank. LESLIE B. BRAGG

Factors affecting the determination of naphthalene by picric acid. A. R. POWELL. Koppers Co., Chicago. *Proc. Am. Gas Assocn.* **1927**, 1421–30.—Some of the fundamental conditions which influence the pptn. of naphthalene picrate are pointed out. The conclusions given are applicable to all naphthalene pptns. with picric acid. The app. consists of seven 8-oz. wide-mouth bottles with stoppers contg. the usual inlet and exit tubes. These bottles are, in their order: 5% H_2SO_4; empty; the following four contain exactly 100 cc. of standard 0.05 *N* picric acid; and the last bottle is empty and serves as a trap for picric acid. The sample line to this train and the first 3 bottles are kept warm to prevent sepn. of naphthalene. The av. gas sample of 20–25 cu. ft. is passed through the app. at about 5 cu. ft. per hr. The picric acid soln. is then transferred to a 500-cc. graduated flask, and this is filled to the mark with rinsings of the bottle. The soln. is filtered, and the first 50 cc. is rejected. 100 cc. of filtrate is titrated with 0.1 *N* NaOH. The grains of naphthalene per 100 cu. ft. is equal to: $(0.0128 \times 1543 \times C)$/cu. ft. gas sample, where $C = 4A - 5B$, and A and B are the cc. 0.1 *N* NaOH required for 100 cc. of the original and final picric acid solns., resp. The rate of gas flow should not be more than 5 cu. ft./hour. It is very important to have the picric acid soln. as concd. as possible, with due regard for the satn. temp. The temp. of the train should be between 65° and 80° F., the ideal temp. being just above the satn. point of the picric acid soln. used. NH_3 in the gas will make the analysis high; its presence is obviated by the H_2SO_4 wash bottle. There is no rapid routine method for the sepn. of naphthalene and gum-forming constituents. SO_2 will cause low analyses; it is therefore important in such cases to insert a wash bottle of weak alkali in the train. H_2S and CO_2 have no appreciable effect on the naphthalene detn. when methyl red is used as indicator. J. H. PERRY

The effect of indene on the determination of naphthalene by picric acid. W. H. FULWEILER, C. W. JORDAN AND A. L. WARD. U. G. I. Contracting Co. Lab., Philadelphia. *Proc. Am. Gas Assocn.* **1927**, 1418–21.—The methods of Brown and Berger (*C. A.* **18**, 3266) were used for the detn. of naphthalene and indene in 3 types of gases, coal, mixed and water gases; the precision is greater than that observed by Brown, but values are still high. With pure naphthalene, the method gave an av. of 108% of the naphthalene used. Brown's finding that there is an error in the titration method due to the pptn. of indene picrate is confirmed but the errors are smaller than those observed by B. In the concns. normally present in city gas, indene is not pptd. by picric acid. If there is present in the picric acid soln. a large amt. of naphthalene picrate, unsatd. hydrocarbons (indene, etc.) are either adsorbed or absorbed and some of the unsatd. hydrocarbons, probably indene, do ppt. or react with picric acid. Until some sp. method for the detn. of either naphthalene or indene is available, it will be difficult to det. the exact error of the usual titration method for naphthalene. The bridge method for the detn. of naphthalene is not affected by the presence of indene in amts. up to 50 grains per 100 cu. ft., and where the atm. of naphthalene detd. is 2 grains or more per 100 cu. ft. J. H. PERRY

A new glass receiver for determination of benzene and benzines with active carbon. A. WEINDEL. *Brennstoff-Chem.* **9**, 234(1928).—The app. consists of a previously described (*C. A.* **21**, 3120) graduated glass U tube in which the condensate steamed out of the active C is caught and sepd. into oil and water. Two changes are made in the design: (1) A side tube is welded into the receiving limb of the U at a point above the liquid level. A tube of active char connected to this serves to retain all light uncondensable vapors. (2) The condensate drops into a small funnel with capillary stem in the receiving limb, whereby, owing to surface tension effects, a sharp sepn. of oil and H_2O is effected. J. D. DAVIS

"Gas benzine" of the Gelsenkirchener Bergwerks-A.-G. tar works. F. KROLLPFEIFFER AND H. SEEBAUM. *J. prakt. Chem.* **119**, 131–56(1928).—The "gas benzine," the volatile fraction condensed after the sepn. of the tar, after treatment with alkali, yielded the following fractions on repeated distn.: (1) b. 33–36° (2.9%), contg. a C_5H_{12} and 2-pentene, (2) 36–40° (1.5%) contg. n-C_5H_{12} and Me_2C:CHMe, (3) 63–67° (4%), contg. $Me_2CH(CH_2)_2Me$ and hexene, (4) 67–70° (4.2%) contg. n-C_6H_{14} and $Me_2C=CH$-CH_2Me (the latter was synthesized by the elimination of H_2O from $Me_2C(OH)Pr$ and from EtCH(OH)CHMe$_2$), (5) 79–82° (1.6%), contg. a mixt. of C_6H_{14} and C_7H_{16} (?)

and C_6H_6. In addn., the presence of cyclopentadiene (identified as dimethylfulvene) in fraction (2), of CS_2 in the fraction of b. p. 40–50°, of MeCOEt, and of minute amts. of Me_2CO in practically all of the fractions, was demonstrated. The phys. consts. of the isolated hydrocarbons are recorded. B. C. A.

The quantitative determination of loss of organic solvents on extraction of water solutions. A. Weindel. *Brennstoff-Chem.* **9,** 213–5(1928).—The method given applies particularly to *detn. of C_6H_6 losses* (by soln. and emulsification) *during extn. of phenols from still waste.* A cylindrical iron container holding 30 l. provided with large inlet and outlet pipes with valves is inserted directly into the discharge line of the C_6H_6 washer for taking the sample. The entire waste stream is sent through this container for several min., then by-passed. The container is disconnected and allowed to stand until any emulsion present rises to the top, leaving a clear soln. at the bottom. This is drawn off and set aside. The C_6H_6 is distd. directly from the large container with steam, condensed and caught in a U receiver, where it is sepd. from the H_2O and measured. The clear soln. is returned to the large container and likewise distd., the C_6H_6 obtained being added to that first recovered. A guard tube filled with active char connected to the intake side of the receiver retains any C_6H_6 that is not condensed. Important features of the method are the large sample and the method of taking it. Small samples were not found representative. J. D. D.

Modern distillation of tar and of naphthalene. Vittorio Molinari. Instituto di Chimica G. Ronzoni, Milano. *Giorn. chim. ind. applicata* **10,** 357–63(1928).—Various continuous systems for the distn. of tar are described, with particular reference to those of Borrmann and of Raschig, which are discussed in detail with illustrations and diagrams. The *purification of crude naphthalene* may be carried out in much the same way. The Sipe plant at Cengio is described (with a diagram), in which the crude naphthalene is distd. *in vacuo* by a continuous process. The naphthalene is condensed at 85°, *i. e.*, above its m. p., by a circulation of hot water and the process is economically superior to processes hitherto in use for purifying naphthalene. The naphthalene is sufficiently pure for direct use in the *manuf. of H acid, α-naphthylamine, β-naphthol and phthalic anhydride for the manuf. of dyes.* C. C. Davis

Description and operation of a tar-distillation plant with horizontal stills according to the patented Weickel system for continuous and discontinuous operation. W. Karsten. *Teer u. Bitumen* **26,** 433–6(1928); cf. *C. A.* **22,** 3035. F. S. Granger

Estimation of the consistency of tar by means of the E. P. C. consistometer. Joseph Malette. École Nationale des Ponts et Chaussées. *Chimie et industrie* **Special No.,** 434–5(April, 1928).—The app. consists essentially of a hollow rod weighted at one end, which is allowed to sink into the tar at 18°. The time required to sink a given distance, as measured by two marks on the rod, is measured with a stop-watch and gives a measure of the consistency of the tar. A. Papineau-Couture

The phenols of lignite tar. J. Frejka and V. Hauk. Masaryk Univ. *Časopis Československého Lékárnictva* **7,** 281–98(1927).—Expts. were conducted on methods for sepn. and isolation of phenols, bases and neutral compds. from lignite tar. The frequently cited method of purification by passing a current of steam through the soln. is unsuitable because of the volatility of some phenols under these conditions. Washing with H_2SO_4 does not give complete sepn. because it dissolves some phenols in addn. to the bases. Detailed results are given on the washing of tar with NaOH solns. of varying concns. William J. Husa

Tests of mechanical and electrical precipitation of tar. F. Seidenschnur and E. Groth. *Brennstoff-Chem.* **9,** 188–93(1928).—Parallel tests are made in which the output of a Koller rotary grate by-product gas producer is detarred in one case by Thyssen centrifugal washer and in another by a Cottrell elec. precipitator. With the washer connected, 13,416 kg. brown-coal briquets were gasified in 68 hrs.; with the precipitator, 11,301 kg. in 61 hrs., an effort being made to secure strictly uniform generator operation in both cases. The washer recovered 95.3% of the tar, the precipitator 99.4%, all tars being practically dust-free, of low water content and otherwise of excellent quality. J. D. Davis

The explosions occurring in the transferring of tar, tar oils, and pitch by compressed air, their supposed causes and their prevention. Leymann. *Zentr. Gewerbehyg. Unfallverhüt.* **14,** 316–25; *Chem. Zentr.* **1927,** II, 2467.—L. compiles the cases known to him, and discusses the causes of the ignition. G. Schwoch

Notes on the (burning) properties of coke. H. Gregor. *Brennstoff-Chem.* **9,** 156–9(1928).—G. dets. ignition and burning properties of coke by kindling a sized coke sample of fixed volume supported on sand in an iron tube, a standard amt. of elec. energy through a wire resistor being used for the kindling. Provision is made for con-

trolled variation of air supply and the results are given as curves showing the relation of air supply rate to rate of consumption of coke. In every case a sharp bend in the curve marks the point of ignition of the coke. J. D. DAVIS

Mechanical strength of coke. G. DÖRFLINGER. *Stahl u. Eisen* **47**, 1867–71 (1927).—The strength is detd. by placing 50 kg. of the coke in pieces of about 50 mm. in diameter in a rotating cylinder which is rotated through 100 revolutions in 4 min. The coke is then screened on a series of screens with holes from 40 mm. to 10 mm. At least 72% should remain on the 40-mm. screen and only a very small quantity of material finer than 10 mm. should be obtained. B. C. A.

Moisture in coke. H. MACPHERSON, L. SLATER AND F. S. SINNATT. *Fuel in Science & Practice* **7**, 444–8(1928).—Moisture-absorption detns. are made upon cokes prepd. in the lab. from 4 coking coals by using, (*a*) the Lessing furnace, (*b*) the Gray-King app. Coal passing a 60-mesh sieve was used and the carbonization temps. ranged from 300° to 900° in 100° stages. Cokes thus prepd. were pulverized, dried, weighed and exposed to the atm. for periods of 24, 48 and 96 hrs. The normal moisture content of the cokes was attained in 24 hrs. A sample carbonized at 700° absorbed the greatest amts. of moisture. D. A. REYNOLDS

Manufacture of coke at Massillon. C. R. LOHREY. Central Alloys Steel Corp. *Blast Furnace & Steel Plant* **16**, 1063–9, 1075(1928).—A detailed description of the layout, construction and operation of a modern by-product coke plant. The process is given in detail from the receipt of the coal to the finished coke and by-products. The results of an av. month's operation are tabulated. J. W. BOECK

Heat balance of the Otto coke-oven battery at the gasworks at Keilehaven, Rotterdam. J. G. DE VOOGD. *Het Gas* **48**, 367–72(1928).—A short heat balance is given of the Otto type coke-oven battery, 50 ovens of 8 tons, 24-hr. coking time, heated by producer gas. On a basis of 15° outside temp., gas or air at standard conditions (0°, 760 mm., dry) the following results were obtained for a coal mixt. of Emma and Maurits (Dutch) pulverized "fat" coal. Per day was carbonized 411800 kg. coal (wet) of 11.50% moisture, 19.98% volatile, 62.20% ash-free coke, 6.32% ash; in the producer plant was used 42962 kg. coke per day (10.4% underfire) of 0.76% moisture, 11.16% ash, 84.85% carbon, 0.57% H_2, 2.66% O + N + S, low calorific value 6911 Cal. (moist); *i. e.*, 720 Cal. in coke per kg. coal carbonized. The carbon loss in ashes was 1.69% of the coke fired (450 kg. per day), the loss in flue dust was 450 kg. per day. Of the producer gas of 1114 Cal. per cu. m. (7.8% CO_2, 23.9% CO, 13.8% H_2, 54.5% N_2, d. 0.880) 202000 cu. m. was consumed per day, representing 540 Cal. per kg. wet coal, the sensible heat of the producer gas (20.4°) being 1 Cal. per kg. coal, sensible heat of air 2 Cal. per kg. coal. The coke yield was 80% of the dry coal at a temp. of 950°, 11.1% ash, sensible heat in coke pushed 232 Cal. per kg. coal carbonized, of which 83.4% was recovered by the dry-quenching installation (128000 kg. steam of 13 atm., 300°, per day). The gas yield was 116167 cu. m. per day at 467° (standpipe) (1.10% CO_2, 1.25% illuminants, 0.85% O_2, 4.05% CO, 20.75% CH_4, 54.70% H_2, 17.30% N_2, 4353 Cal. per cu. m., upper value), tar yield 22 kg. per ton coal with 209 Cal. sensible heat per kg. at 467°, water formed 3% of dry coal weight with 796 Cal., per per kg., a total of 67 Cal. per kg. coal sensible heat in the gaseous products. For the sensible heat of the moisture in the coal 92 Cal. per kg. coal is calcd. at 467°, the sensible heat of the stack gases was for 368000 cu. m. per day at 265°, 16.64% CO_2, 1.90% O_2, 0.06% CO, 81.40% N_2, 84 Cal. per kg. coal, the radiation losses were 101 Cal. per day and per kg. coal. The efficiency of the producer plant was 75% (only 72% of the max. load was used); for the battery the sum total on the left side of the balance lacks 33 Cal. because of exothermic reactions and including all the errors. For dry coal the underfire would have been 458 Cal. per kg. B. J. C. VAN DER HOEVEN

Colorimetric determination of CS_2 in gas (DÉSY) 7. A unique installation combining coal and oil firing of an annealing furnace (DAVIS) 9. Progress in ore dressing and coal preparation in 1927 (RICHARDS, LOCKE) 9. Coal-dust explosions (STEINBRECHER) 24. The chemical composition of peat (WAKSMAN, STEVENS) 8. The determination of free C in tars, pitches and the like (BERL, SCHILDWÄCHTER) 7. New theories of the formation of coal (FUCHS) 8. Economic symposium on N (HAYNES, *et al*) 13. Air investigations to determine smoke damage (BAMBERGER, NUSSBAUM) 14. Analysis of gaseous mixtures containing CO_2, CO, H and CH_4 (BROOM) 7. Synthesis of organic substances and of NH_3 starting with water gas without employing catalyzers (BRUTZKUS) 2. Heat-transfer data for the scrubber designer (ROSEBAUGH) 13. Partial oxidation of CH_4 and ethane in the presence of catalysts (LAVINO, SOUKUP) 2. Power gas from sludge (VOKES, TOWNSEND) 14. Phenol pollution of public water supplies in the

Middle West (BUNDESEN) 14. The amount of loss during heating in furnaces fired with coal dust (RUMMEL) 9. Material for grate bars (STUMPER) 9. Possible working substances for vapor power plants (LOSCHGE) 13. Reactions between CO, CO_2 and H in a "cold-warm" tube at atmospheric and high temperatures (FISCHER, WANGENHEIM) 2. Some gas reactions in a "cold-warm" tube (FISCHER, WANGENHEIM) 2. The flicker of luminous flames (CHAMBERLAIN, ROSE) 2. Measurement of the temperature of stationary flames (LOOMIS, PERROTT) 2. Diffusion flames (BURKE, SCHUMANN) 2. Purifying gases by adsorption (Brit. pat. 284,758) 13. Hydrogenating hydrocarbons (Brit. pat. 284,655) 4. Extrusion press for expressing liquid from peat (Brit. pat. 284,318) 1. Fractional liquefaction and separation of constituents of gases (Brit. pat. 284,213) 13. Valve and pipe system and diaphragm governor for proportionately mixing air and fuel (U. S. pat. 1,684,500) 1. Apparatus for low-temperature distillation of coal (U. S. pat. 1,685,496) 1. Vertical column apparatus for drying coal (U. S. pat. 1,685,338) 1. Apparatus for grading coal (Fr. pat. 635,240) 1.

Jahrbuch der deutschen Braunkohlen-, Steinkohlen- Kali- und Erz-Industrie 1928. Issued by Deutscher Braunkohle-Industrie-Verein E. V. Halle (Saale): Verlag von Wilhelm Knapp. 431 pp. Reviewed in *Chimie et industrie* 20, 597(1928).

BERTHELOT, CH.: **Les combustibles dans l'industrie moderne.** Paris: J. B. BAILLIÈRE ET FILS. 656 pp. Paper, F. 90; bound, F. 102. Reviewed in *Chimie et industrie* 20, 595(1928).

Plant for the heat treatment of fuel and recovery of volatile constituents. OTTO HELLMANN. Fr. 636,043, June 16, 1927.

Distilling powdered fuel. TROCKNUNGS-, VERSCHWELUNGS- UND VERGASUNGS- GES. Brit. 285,015, Feb. 8, 1927. Powd. bituminous material such as coal is injected upwardly into an externally heated distg. chamber and coke formed and distillates are withdrawn from the top of the chamber. Details of the app. used are described.

Liquid fuel mixture. ELMER H. RECORDS. U. S. 1,684,685, Sept. 18. A fuel mixt. suitable for use in internal-combustion engines comprises alc. 72, C_6H_6 18, ether 5, naphthol 2.5, H_2O_2 1.5 and NaOH 1%. U. S. 1,684,686 specifies alc. and water 72, C_6H_6 18, ethyl ether 5, $C_{10}H_8$ 2.5, O (which may be supplied by ozone or H_2O_2) 1.5 and NaOH 1%.

Motor fuel. LOUIS J. P. GUIAUD. Fr. 32,756, Dec. 18, 1926. Addn. to 617,225. Two l. of a mixt. of 70 parts of toluene, 8 parts of naphthalene and 22 parts of mineral oil are added to 5 l. of petroleum spirit.

Pressure-controlled apparatus for proportioning liquid fuel and air supplied to furnaces. BARTON H. NOLAND. U. S. 1,685,031, Sept. 18.

Systems and vaporizing devices for preparing gasified fuel mixtures from atomized liquid fuel and air. ERNEST R. GOODWARD (to Eclipse Petrol Economizer Co., Ltd.). U. S. 1,686,609–10–11, Oct. 9.

Drying powdered coal. N. TESTRUP, O. SODERLUND, T. GRAM and TECHNO-CHEMICAL LABORATORIES, LTD. Brit. 284,405, Oct. 28, 1926. A friable mixt. is formed of coal slurry and dry powder and is dried in a current of air by which it is entrained.

Feeding powdered coal to furnaces. EUGEN WEYHENMEYER. Fr. 635,687, June 9, 1927.

Agglomerates of coal. HOWARD H. DEACON. Fr. 635,217, May 30, 1927. To lessen the amount of agglomerate used, the coal is first mixed with a liquid such as a mineral, animal or vegetable oil or creosote or tar.

Extracting coal and other bituminous materials. P. DVORKOVITZ. Brit. 285,564, Nov. 17, 1926. Bituminous material such as coal, after heating (suitably to about 500°) to distil off part of the org. matter, is treated with a solvent such as petroleum oil or gas tar to ext. addnl. org. matter.

Briquetting coal. HERBERT É. WETHERBEE, RICHARD F. GRANT and HOWARD M. HANNA. Fr. 635,290, May 10, 1927.

Apparatus for gravity separation of coal and ore constituents by use of a liquid and solid mixture of intermediate density. THOMAS M. CHANCE. U. S. 1,686,435, Oct. 2.

Apparatus for producing colloidal fuel by pulverizing coal or similar material in successive stages and treating with oil. HENRY ADAMS. U. S. 1,685,115, Sept. 25.

Carbonization of vegetable materials. SOCIÉTÉ D'ÉTUDES POUR LES COLONIES ET L'ÉTRANGER and MAURICE JUHEL. Fr. 635,682, June 8, 1927. An app. is described for the production of vegetable C, and the recovery of by-products. The chambers are U-shaped.

Water-soluble products from lignite, etc. I. G. FARBENIND. A.-G. Brit. 284,670, Feb. 3, 1927. Lignite and similar fossil materials, which may be degraded by use of sulfite or otherwise, are treated with Cl in the presence of alkali, care being taken to avoid development of acidity during the reaction. Light-colored sol. products contg. Cl are obtained and by gradually adding NaOH during the reaction and thus increasing the salt content a ppt. is formed which may be dried to a yellow powder and ppts. gelatin.

Apparatus for drying peat. M. S. TUIPERMAS. Russ. 3990, Nov. 30, 1927.

Dehydration of peat. SUPREME ECONOMIC COUNSEL OF THE U. S. S. R. Russ. 3851, Oct. 31, 1927. The peat mass is mixed with a colloidal soln. of Fe_2O_3 to coagulate the colloids present and the product obtained is treated as usual, *i. e.*, settled out, filtered and pressed.

Dewatering peat. FELIX GINSBACH (to Heinrich Horst). U. S. 1,686,807, Oct. 9. In dewatering by compression in stages, the first stage comprises compressing and dewatering raw peat after admixt. with peat previously dewatered by compression, and the second stage consists in compressing and dewatering the product of the first stage after adding dry peat.

Manufacture of light oils from complex organic compounds. DANIEL FLORENTIN, ANDRE KLING and CAMILLE MATIGNON. Fr. 32,521, Oct. 23, 1926. Addn. to 608,560. Phenolic oils (phenol, cresol, etc.) yield benzene, etc., when treated with H in the presence of dehydrating catalysts such as alumina or thoria. Tars from low-temp. distn. of oil can also be used if treated with substitution as well as dehydrating catalysts at the same time, *e. g.*, Al_2O_3 and anhydrous $AlCl_3$.

Apparatus for purifying oil of internal-combustion engines by distillation of light substances. JAMES F. WELLS. U. S. 1,686,304, Oct. 2.

Obtaining highly concentrated ammonia gas directly from crude ammonia water. L. F. FOKIN and E. E. LIDER. Russ. 3856, Oct. 31, 1927. NH_3, water vapor and volatile admixtures which are generated by heating crude NH_3 water in a column app. after passing the dephlegmator are cooled below the dissocn. temp. of $(NH_4)_2CO_3$ and $(NH_4)_2S$ to sep. CO_2 and H_2S as solid $(NH_4)_2CO_3$ and $(NH_4)_2S$. These ppts. are removed periodically. The app. for condensing the impurities has an equipment for chilling and heating.

Purification of acetylene. C. H. BOEHRINGER SOHN. Fr. 32,598, Dec. 3, 1926. Addn. to 564,441. C_2H_2 is purified by treating with absorbent material such as active C or active SiO_2 gel. A pretreatment with the usual purifying agents may be made.

Gasifying bituminous fuels. ALBERT BREISIG. Austrian 109,169, Nov. 15, 1927. In complete gasification of bituminous fuels the hot gases from the blasting period are used to heat accumulators which serve to superheat the steam during the "run" and also the whole or part of the gases produced. These gases are led back into the producer. The improvement consists in operating the process so as to obtain a surplus of coke, which is continuously removed.

Heating or gasifying apparatus. GEZA SZIKLA. Austrian 109,020, June 15, 1926. The app. is of the kind in which finely divided solid or liquid fuel is fed in near the bottom of a shaft and burned or heated by an ascending current of gas.

Furnace construction in which a primary combustion chamber serves as a gas producer with powdered or liquid fuel. E. S. SUFFERN, GASIFIED FUEL, LTD., H. E. HAZELHURST and O. MARGETSON. Brit. 284,738, Sept. 1, 1926.

Tube and header heat exchange apparatus for treating coal gas, water gas or other gases. H. TINDALE. Brit. 284,413, Nov. 1, 1926.

Gas-producer construction and operation. SOC. DE CONSTRUCTION D'APPAREILS POUR GAZ A L'EAU ET GAS INDUSTRIELS (to Humphreys & Glasgow, Ltd.). Brit. 285,004, Feb. 8, 1927. Steam and O are supplied to a gas producer so that heat generated by the O maintains the fuel bed sufficiently hot for the continued generation of water gas by the steam, after a preliminary blasting with air or O. Various details of construction are described.

Gas producers for feeding motors. ÉLIE JAQUES. Fr. 635,254, May 31, 1927. Two furnaces are provided which are used alternately, the gaseous products from the lighted furnace being obliged to pass through the unlighted one.

Fuel gas. FRITZ WINKLER (to I. G. Farbenind. A.-G.). U. S. 1,687,118, Oct. 9. In mfg. fuel gas in a generator having a bed of small-sized, incandescent carbonaceous material supported by a grate, gas such as air and steam is blown through the material with sufficient speed to cause a "boiling action" in the material and to effect gasification reaction. An app. is described.

Coal-gas and oxygen burner. WM. S. BARKER. U. S. 1,686,508, Oct. 9. Structural details.

Gas purifier. ÉLIE JAQUES. Fr. 635,255, May 31, 1927. Constructional features.

Gas purification. FREDERICK W. SPERR, JR. (to The Koppers Co.). Can. 283,774, Oct. 2, 1928. H_2S is absorbed by means of a wash liquor contg. an Fe compd.; NH_3 is recovered by distn. of the wash liquor; and the distn. residue is aerated to regenerate the Fe compd. with liberation of S.

Gas-purification apparatus. FREDERICK W. SPERR, JR. (to The Koppers Co.). Can. 283,776, Oct. 2, 1928. App. for carrying out the process of the preceding patent is specified.

Scrubber device for washing gases in furnace flues. W. W. ROBINSON. Brit. 284,919, June 7, 1927.

Apparatus for utilizing impure or exhaust gases containing carbon dioxide. FRIEDRICH RIEDEL (to Riedel Fertilizing Process Co.). U. S. 1,687,229, Oct. 9. Combustion gases from carbonaceous fuel are introduced into an alk. soln. such as Na_2CO_3 or K_2CO_3 which may be contained in a vessel heated by fuel from which the combustion gases are produced, and gases after passing through the soln. are led under gentle expansive force into proximity to growing plants.

Treating tar. F. C. BUNGE and H. MACURA. Brit. 285,000, Feb. 8, 1927. See Fr. 633,643 (*C. A.* **22**, 3519).

Distilling tar. S. P. MILLER (to Barrett Co.). Brit. 284,703, Feb. 5, 1927. Hot gases from coke ovens are used for the distn. of tar by spraying the tar into the hot gases in a collecting main to which the gases are led from a plurality of ovens. The vapors thus formed are removed from the distn. main and are cooled and condensed. Various details of the app. used are described. Cf. *C. A.* **22**, 3764.

Distillation of coal tar. CARL WESSEL. Fr. 636,053, June 16, 1927. See Brit. 273,675 (*C. A.* **22**, 2049).

Dehydrating and distilling tars and oils. DOUGLAS RIDER (to Thermal Industrial and Chemical Research Co., Ltd.). U. S. 1,685,034, Sept. 18. The liquid to be treated is passed through a duct immersed in a bath of molten metal, which is maintained at a temp. but a few degrees higher than the b. p. of the fraction that it is desired to vaporize, and the liquid is caused to issue from the duct above the surface of the molten metal and to spread over the latter in an even layer. An app. is described.

Breaking aqueous emulsions of tar. B. JOHNSON. Brit. 284,401, Oct. 27, 1926. Aq. emulsions of tar are broken by adding a carboxylic acid which is sol. in the tar but not in the water; *e. g.*, resin acids, oleic acid, stearic acid, palmitic acid, arachidic acid or linolenic acid may be used. Alkali in sufficient quantity to make the sepd. water alk. may be preliminarily added to tar emulsions not contg. NH_3.

Resolving emulsions of tar or oil. HERBERT W. ROBINSON and DERIC W. PARKES. U. S. 1,687,314, Oct. 9. See Brit. 268,547 (*C. A.* **22**, 1419).

Coke. CHARLES L. WAGGONER and FRANK B. THACHER (to By-Products Coke Corp.). U. S. 1,685,654, Sept. 25. In order to improve the properties and lessen clinkering of coke produced by high-temp. distn. processes and brought to a porous condition of relatively low d. with the oily substances and volatile constituents substantially completely removed, the porous mass, subsequent to the high-temp. distn., is treated with a moisture-absorbing substance of the Ba group, *e. g.*, $CaCl_2$.

Means for discharging coke from gas generators. ALBERT BREISIG. Austrian 108,912, Oct. 15, 1927. Constructional details.

Machine for evacuating coke furnaces. NAAMLOOZE VENNOOTSCHAP, SILICA EN OVENBOUW MAATSCHAPPIJ. Fr. 636,051, June 16, 1927.

Device for cleaning carbon deposits from inside of coke ovens by use of blasts of compressed air, etc. J. A. LOVETT (to Koppers Co.). Brit. 285,070, Feb. 12, 1927.

Quenching coke. SOC. GÉNÉRALE DE FOURS À COKE SYSTEME LECOCQ. Brit. 284,721, Feb. 5, 1927. Steam produced in quenching hot coke is treated, before escaping to the atm., with a water spray to free it from coke dust and to effect partial condensation. An app. is described.

Vertically flued coke-oven construction. C. WESSEL. Brit. 284,606, Jan. 31, 1927.

Coke-oven construction and discharging apparatus. C. B. COLLINS and J. A. B. LOVETT (to Koppers Co.). Brit. 284,311, Jan. 29, 1927.

22—PETROLEUM, LUBRICANTS, ASPHALT AND WOOD PRODUCTS

F. M. ROGERS

Dephlegmation. K. V. Kostrin and N. M. Akopov. *Neftyanoe Khozyaistvo* **13,** 311–6(1927).—A lab distg. flask is connected to a vertical glass tube 30 mm. wide and 300 mm. high insulated with 50 mm. of asbestos. A glass U-tube connects this tower with the top of a reflux condenser. The bottom outlet of this reflux condenser has a glass T, one side of which is connected to a Liebig condenser and the other to a gas trap, which can be connected either to a second Liebig condenser or directly with the still. The jacket of the reflux condenser is used for steam to hold the vapors at a const. temp. The distn. can be run either on the open fire or on steam. The vapors are carried through the 300-mm. insulated glass tube through the top of the reflux condenser, which acts as a dephlegmator. Part of the vapors are condensed and passing the gas trap enter the Liebig condenser or the still. The uncondensed vapors are condensed in the 2nd condenser. The table below shows the work performed by this app.: (I) with open fire without redistn. of the condensate from the reflux condenser, (II) same with steam but no fire, (III) open fire and redistn. of the condensate, (IV) steam but no fire.

	I	II	III	IV
Charge	3000g.	3000g.	3000g.	3000g.
Highest temp. of vapors	97°	98°	97°	98°
Distillate obtained	49g. (1 63%)	1965g. (65.50%)	181g. (6.03%)	1967g. (65.57%)
Reflux	187g.	165g.	....	....
Sp. gr. of distillate	0.7282	0 7820	0.7472	0.7790
Sp. gr. of reflux	0.7611	0.8050	....	....
H_2O condensate with distillate	....	1860g.	....	1854g.
H_2O condensate with reflux	....	700g.	....	....
Temp. of steam	....	170°	....	170°
I.b.p.	63°	46°	64°	48°
Engler distillation:				
I.b.p. of distillate	46°	88°	68°	88°
I.b.p. of reflux	78	115	....	....
25% off distillate	75	121	83	118
25% off reflux	94	157	....	....
50% off distillate	83	137	88	133
50% off reflux	101	173	....	....
95% off distillate	110	191	117	192
95% off reflux	149	225	....	....

Temp. in the dephlegmator (reflux condenser) when the still was heated with fire was 173°, with steam only 98°. Red Surakhanui crude oil was used for this expt. This expt. confirms the results obtained by N. A. Alekseyev (*Azerbeydj. Neft. Khoz.* **1926,** No. 2, 65; **1927,** No. 3, 49–53. A. A. Boehtlingk

The petroleum industry in the year 1927. Richard Kissling. *Erdöl u. Teer* **4,** 440–2, 458–9, 475–8(1928).—A review with references. F. S. Granger

World production of petroleum in 1927. J. Filhol. *Ann. office nat. comb. liquides* **3,** 283–307(1928).—A statistical review which compares the production for 1927 with the yearly production for the period 1910–27. R. E. Schaad

Petroleum and petroleum products. Arthur Knapp. *Mineral Ind.* **36,** 415–45 (1927).—World production, refining and advances in technology are discussed; also oil shales and natural gas. A. B.

Things one should know about petroleum and its products. A. A. Potter and H. L. Solberg. Purdue Univ. *Power* **68,** 523–6(1928).—A general discussion. D. B. Dill

Insulating pipes and tanks in an oil refinery. H. L. Kauffman. *Power* **68,** 511–2 (1928).—Details are given for insulating refrigerating equipment. D. B. Dill

The oil field salt water pollution problem. J. G. McIntosh. *Proc. 10th Texas Water Works Short School* **1928,** 247–50; *U. S. Pub. Health Eng. Abstracts* **E-637,** 50 (1928). J. A. Kennedy

Metallic alloys in the mineral-oil industry. Hans Magnus. *Metallbörse* **17,** 1463; *Chem. Zentr.* **1927,** II, 1112. J. S. Reichert

Composition of petroleum and its products. GEORGE A. BURRELL. *Fuel in Science & Practice* **7**, 416–23, 463–5(1928).—See *C. A.* **22**, 2832. D. A. REYNOLDS

First attempts at an independent solution of the naphtha question in Poland. W. DIAMAND. *Przemysl Chem.* **12**, 255–61(1928). Largely statistical. *Ibid* **12**, 299–307.—Discusses the economics of difficulties of the Polish petroleum situation. A. C. Z.

The chemical composition of bituminous slates and the crude oils to be manufactured from these, with special regard to the sulfur-rich ichthyol oils as a technological index of their value. RUDOLPH NIEDERLEUTHNER. *Wiss. Mitt. Österreichischen Heilmittelstelle* 1927, 6–8; *Chem. Zentr.* 1927, II, 1318. G. SCHWOCH

Oil recovery through the use of natural gas. E. O. BENNETT. *Oil Bull.* **14**, 826–8(1928).—Gas dissolved in oil lowers the viscosity of the oil and so facilitates its flow through the oil sands. It is almost impossible, however, to replace gas in soln. in the oil remaining in a subsurface structure since agitation cannot be effected. It is therefore desirable to limit the amt. of gas produced from an oil well as nearly as possible to that originally in the oil reservoir that was drilled into. Observed data indicate that repressuring started during the first 5% of the normal life of the field will result in an ultimate production of 200–300% more than where the gas is not conserved. D. F. BROWN

Combating paraffin and associated production problems in Texas panhandle. L. L. BECHTEL AND W. O. BLENKARN. Am. Petroleum Inst. Development & Production Eng., *Bull.* No. **202**, 133–7(1928).—Paraffin deposits in pumping wells are best removed by steaming or with elec. heaters. Hot water may also be used. Wells normally producing a high percentage of water are usually fairly free from paraffin trouble. In gas lift wells a scraper is usually used. The use of steam heating on gas lift wells where S gas is found is not recommended because of the accelerated corrosion due to the moisture. Paraffin deposits in or on the walls of the bottom hole formation are best removed by washing with hot water or lye soln. D. F. BROWN

The influence of colloids and suspensoids on the solubility of gases in liquids. FRANK E. GERMANN. Am. Petroleum Inst. Development & Production Eng., *Bull.* No. **202**, 101–5(1928); cf. *C. A.* **22**, 3769.—Adsorption of gas upon solid surfaces probably accounts for the apparent greater soly. of gas in oil contg. sand than in pure oil. Factors effecting the soly. of gas in liquid contg. suspended solids are whether adsorption of the gas on the solid surface is pos. or negative, the order of magnitude of the adsorption, size of the solid particles, compactness of the solid particles, vapor tension and vapor pressure of the liquid, temp. and curvature of the surface. Until it is known definitely what laws are operative, underground conditions cannot be explained or forecast by means of laws which are known to apply to solns. free of all solid matter. D. F. BROWN

Scientific foundations of the refining of petroleum. V. Cracking. A. E. DUNSTAN. *J. Roy. Soc. Arts* **76**, 1001–24(1928); cf. *C. A.* **22**, 4235.—A lecture (the last of the series) covering a brief description of the main cracking processes, berginization, the refining of cracked distillates, and the production of alc. and their derivs. from the unsatd. gases from cracking stills. G. CALINGAERT

The manufacture of gasoline by cracking oils. F. KOUDELÁK. *Paliva a Topení* **10**, 36–7, 51–6(1928).—A review of about 10 com. processes in current use. F. M.

Fifteen years of the Burton process. R. E. WILSON. *Ind. Eng. Chem.* **20**, 1099–1101(1928).—A short outline of the history of the Burton cracking process and of its influence on the development of the oil industry. G. CALINGAERT

Use of the float and sink method for isolation of organic matter in oil shales. K. LUTS. *Brennstoff-Chem.* **9**, 217–8(1928).—Treatment of the shales with 5% HNO_3 and H_2F_2 gives more complete removal of mineral matter (to 1% total) than the recommended treatment with HCl and H_2F_2. In both methods, however, org. matter is attacked as evidenced by its change of color. L. treats the finely powd. shale with $CaCl_2$ soln. of 1.06 to 1.15 sp. gr. and whirls on a centrifuge at 3000 r. p. m. till all the organic matter rises to the top of the container. This is easily filtered and washed free from $CaCl_2$. Ash is reduced to a total of 3 to 7%. J. D. DAVIS

Methods of estimating paraffin hydrocarbons in commercial benzene and motor fuel. R. HEILINGÖTTER. *Chem.-Ztg.* **52**, 437–8(1928).—A critical review. The Me_2SO_4 absorption method is unreliable for detg. paraffin hydrocarbons (cf. Graefe, *C. A.* **1**, 1909). Benzine-C_6H_6 mixts. contg. less than 50% of benzine cannot be sepd. by the method of Kattwinkel (*C. A.* **19**, 1113), in which Ac_2O contg. AcSH is used. The refractometer method proposed by Pritzker and Jungkunz (*C. A.* **17**, 2188) also gives inaccurate results (cf. Wolff, *C. A.* **17**, 2779). The most reliable method of

detg. benzine in fuels depends upon its insoly. in fuming H_2SO_4 which sulfonates and dissolves aromatic hydrocarbons. R. E. SCHAAD

Action of accelerators and inhibitors upon the oxidation of liquid hydrocarbons. T. E. LAYNG AND M. A. YOUKER. *Ind. Eng. Chem.* **20**, 1048–52(1928).—Motor fuels such as heptane, gasoline and kerosene were oxidized by heating with O in a glass bulb and the effect of various antiknock substances on the rate of oxidation was observed. Oxidation of heptane in the gas phase appears not to be through its normal alc. Heptyl alc. may be oxidized only with difficulty in the gas phase. Lead tetraethyl delays the accelerating action of butyl nitrite, but if once started the path of oxidation is the same as when not delayed. Aniline, diphenylamine, lead tetraethyl and K ethylate are all inhibitors of gas-phase oxidation. There is no relation between the engine test evaluation of inhibitors and the values obtained in their slow oxidation data for gas-phase oxidation. EtOH, aniline, diphenylamine and Al ethylate are not accelerators of liquid-phase oxidation. Lead tetraethyl and K and Na ethylate are accelerators of liquid-phase oxidation when present in extremely small percentages. Lead tetraethyl and K and Na ethylate exhibit a surprising similarity in their effect on gas and liquid-phase oxidation. The data obtained are not thought to affect the peroxide theory of hydrocarbon oxidation. The data indicate that an ideal antiknock substance might be obtained by incorporating a powerful inhibitor of only vapor-phase oxidation with a powerful accelerator of only liquid-phase oxidation.
D. F. BROWN

Determination of unsaturated hydrocarbons in gasoline by means of bromine. G. ZD'ÁRSKÝ. *Chem. obzor* **3**, 165–8, 205–10(1928).—The absorption of Br by gasoline depends (1) on the time of action of Br on the gasoline, (2) on the ratio of gasoline to Br and (3) on the method of shaking. Br sepd. from 0.1 *N* KBr and $KBrO_3$ soln. by means of H_2SO_4 (20%) does not react readily with Kahlbaum's normal gasoline in the absence of light but a remarkable absorption takes place on using 0.1 *N* Br water. The soln. turns acid, the acidity being approx. directly proportional (till about half of the Br soln. is used up) to the quantity of Br consumed. The action of Br on gasoline hydrocarbons is, therefore, not a simple addn. of Br by unsatd. hydrocarbons. The formation of HBr indicates also that the formation of HBrO and brominated hydrocarbons or that other complicated reactions are taking place. An app. is described for assuring the exact measurement of Br water and a small bottle with a funnel is devised for eliminating the loss of Br during the expts. JAROSLAV KUČERA

Flame characteristics of "pinking" and "non-pinking" fuels. G. B. MAXWELL AND R. V. WHEELER. Sheffield Univ., Eng. *Fuel in Science & Practice* **7**, 383–97. —See *C. A.* **22**, 3038. D. A. REYNOLDS

Hydrogenation in the petroleum industry. H. I. WATERMAN AND J. N. J. PERQUIN. *J. Inst. Petroleum Tech.* **11**, 36–60(1925).—In the introduction the authors discuss the *hydrogenation of cottonseed oil* at very high pressures and the transformation of the oil at high temps. At 450° a high percentage of hydrocarbons is formed and from the O balances it is shown that the larger part of the O is expelled after a very short time. Further the Bergius process is discussed and some details are given about expts. carried out at high temps. with paraffin wax under high pressures caused by different gases such as CH_4, N_2 and H_2 and with nascent H produced by the reaction $CO + H_2O \longrightarrow CO_2 + 2H$. Only H under high pressure gives the most favorable results. The second part of the paper deals with the decompn. of paraffin wax in the presence and absence of H under high pressure. This part has already been abstracted (*C. A.* **19**, 1345) from an incomplete copy of the original paper. H. I. W.

Some flame characteristics of motor fuels. G. B. MAXWELL AND R. V. WHEELER. Sheffield Univ., England. *Ind. Eng. Chem.* **20**, 1041–4(1928); cf. *C. A.* **22**, 3038.—From a study of flame movement and pressure development in a cylinder during the combustion of pentane-air, benzene-air, pentane-benzene-air, pentane-ethyl ether-air mixts. it is concluded that "pinking" explosions are due to the completion of combustion behind the flame front from the impetus of a shock wave when the vibrating flame is arrested. The decompn. products of lead tetraethyl are responsible for its antiknock quality. ARTHUR FLEISCHER

Importance of mixture ratio in rating fuels for knock. JOHN M. CAMPBELL, WHEELER G. LOVELL AND T. A. BOYD. Research Lab. General Motors Corp., Detroit, Mich. *Ind. Eng. Chem.* **20**, 1045–8(1928).—The max. knock-fuel ratio curves detd. for benzene-gasoline blends contg. varying quantities of lead tetraethyl and for heptane-isooctane mixts. show a max. knock at a given fuel-air ratio. Mixt. ratios giving max. knock are advocated as a means of getting consistent results between different labs. ARTHUR FLEISCHER

Self ignition and detonation. ARNOŠT VYSOKÝ. *Paliva a Topení* **10,** 9–14(1928).—A discussion of fundamental principles involved in detonation of fuels in high-compression engines. FRANK MARSH

Evaluation of gas oils. Chemical considerations and analytical methods. T. A. MIGHILL. Pawtucket Gas Co., Pawtucket, R. I. *Proc. Am. Gas Assocn.* **1927,** 1454–63.—The following premises are used as an argument for the possibility of evaluating a gas oil: (1) Since all gas oils boil over about the same range, it is likely that there will be about the same individual members in each series; (2) each hydrocarbon will have its characteristic efficiency of pyrogenic decompn. at any fixed temp., where the efficiency means the amt. of heat of combustion added permanently to the gas from the thermal decompn. of a gallon of gas oil divided by the heat of combustion of a gallon of the same oil; (3) the analysis of a gas oil gives roughly the % of each series; (4) by assigning a heat efficiency to each series and detg. the % of the series in the oil, the product of these percentages should give the efficiency of the series in that oil; (5) the total heat efficiency of the oil will be the sum of the partial efficiencies as detd. by (4). By cracking the oil in a hot tube and detg. the B. t. u. added to the gas from a known amt. of oil, combined with an analysis of the oil, the following provisional efficiencies for each of the four series of hydrocarbons have been obtained: paraffins 100% (arbitrary); naphthenes 70%; aromatics 50%; and unsaturates 25%. The following analytical methods are proposed: *Unsaturates.*—Place 15 cc. of the oil and 30 cc. concd. H_2SO_4 in a straight long-necked flask; cool the mixt. for $^1/_2$ hr. in ice-H_2O. Turn the contents of the flask into a centrifugal tube and rinse the flask with H_2SO_4 into the same tube. Centrifuge and read the vol. of unattacked oil. From the loss divided by the original 15 cc., det. the % of unsaturates. *Aromatics.*—Pipet 10 cc. of the residue from the above treatment into a small separatory funnel. Put 15 cc. fuming HNO_3 in a centrifugal tube cooled in a freezing mixt. of ice and salt. Pour the oil (a few drops at a time) into the HNO_3, stirring the mixt. ($^3/_4$ hr. required to add all the oil). Allow the mixt. to stand 15 min. and then centrifuge. Of the 3 layers appearing, read the top layer and subtract from 10, which gives the cc. of aromatics used. *Naphthenes.*—Place 5 cc. of the oil unattacked by the above treatment in a long-necked, straight flask, and add 10 cc. (1:1 by wt.) of a mixt. of H_2SO_4 and HNO_3. Float the flask on H_2O which is simmering, shaking the flask often. When oxides of N cease to be evolved (after about 2 hrs.), transfer the still warm contents of the flask into a centrifuge tube, rinsing out the flask with 3 portions of acid into the tube. The oxidized products can be sepd. from the remaining oil with petroleum ether as follows: Add 8 cc. petroleum ether to the tube and stir with an air current, centrifuge and read the amt. of waxy matter. Cool the tube in ice water and reread. Add 8 cc. of the ether and repeat the procedure. If the reading shows a diminution of more than a few tenths of a cc., repeat the procedure with 8 cc. petroleum ether. *Paraffins.*—These are obtained by difference, 100 − % of [unsaturates + aromatics + naphthenes]. J. H. PERRY

Uniformity in Diesel fuel oil specifications. G. H. MICHLER. Standard Oil Co., N. J. *Power* **68,** 191–4(1928).—See *C. A.* **22,** 3768. D. B. DILL

Navy specifications for Diesel oil. H. C. DINGER. *Power* **68,** 556–7(1928).—The principal requirements are: min. flash point 150° F.; max. viscosity, 200 sec. at 32° F.; max. water and sediment, 0.5%; max. S, 1.5%; max. ash, 0.1%. D. B. DILL

Burning boiler oil in Diesel engines. JAMES M. BLOOMFIELD. *Power* **68,** 594–5 (1928).—After some experimentation, successful use was made of boiler oil of the following properties: gr., 12.25° Bé., *flash point,* 290° F.; *viscosity* at 122° F., 27 sec. Saybolt. D. B. DILL

Principles of steel mill lubrication. E. P. MALLISON. *Iron Age* **122,** 827–31 (1928). E. J. C.

Changes in transformer oils. II. K. TYPKE. *Z. angew. Chem.* **41,** 418–25 (1928).—A review of recent literature dealing with the nature of the changes which take place in transformer oils during use, the products formed, and precautions to be taken to retard the progress of these changes. B. C. A.

The aging of transformer oils. I. K. TYPKE. A. E. G., Berlin. *Z. angew. Chem.* **41,** 148–53(1928).—This first part of T.'s review discusses the following factors of the aging of transformer oils: O, refining of the oil, temp., time, substances coming in contact with the oil, admixt. of other oils, light, elec. field. 74 references. G. C.

Insulating oils for high-voltage cables. T. N. RILEY AND T. R. SCOTT. *J. (Brit.) Inst. Elec. Eng.* **66,** 805–40(1928); cf. *C. A.* **22,** 1637.—The general requirements of oils for insulating high-voltage cables are described. Flash point is usually between 260° and 315°. The effects of variation in *set point* upon *power factor* are described as well as the influence of various factors upon set point. Viscosity is detd. in abs. units by

the U-tube method. A steep viscosity-temp. curve is desirable if not obtained by addition of resin. The d. c. resistance of oils increases with time, this being apparently due to the building up of contact resistance. In detg. a. c. characteristics, accurate measurement of *leakance* and capacity is necessary. Power factor can be taken as $G/(\omega C)$, where G = leakance, $\omega = 2\pi \times$ frequency and C = capacity. Power factor-temp. characteristics are important in relation to the actual value of dielec. losses, and as an index of the chem. and phys. stability of the oil. The elimination of gas pockets in the dielec. is essential, not only to prevent burning and oil oxidation, but to obtain low thermal resistivity. The variation in power factor with long heating is measured, the increase in power factor affording a measure of deterioration. Curves are shown. H. Stoertz

Methods of testing transformer oils. I. Musatti and R. Volterra. Istituto Scientifico Tecnico Ernesto Breda, Milano. *Giorn. chim. ind. applicata* **10**, 397–408 (1928).—In continuation of work on the oxidation of transformer oils (cf. M. and Pichetto, *C. A.* **19**, 3584), expts. were directed toward developing a method sufficiently rapid and precise to classify oils according to their resistance to deterioration in service. All methods based on oxidation in the open are subject to grave errors, a very large part of the products being eliminated, so that quite different results are obtained from those under conditions where the products are retained. Moreover, these methods are long and troublesome. An attempt was therefore made to develop a rapid *method* of oxidation out of contact of air, either in O in a closed medium or by conducting in O under const. pressure in the absence or in the presence of Cu. The expts., which deal particularly with the factors which influence the oxidation, indicate that the optimum conditions are to heat the oil 2–3 hrs. at 200°, with a const. pressure of O. The accelerating action of Cu, which is almost negligible in a closed medium, becomes intense when operating at a const. pressure of O. The nature of the oxidation process remains, however, essentially the same either in the presence or in the absence of Cu, so that the utilization of Cu to accelerate the deterioration is justified. The curves which express the course of the oxidation as a function of time are similar whether Cu is present or absent, the curves of the sludge diverging from the time axes and the acidity curves bending toward them. The 2 methods of testing which were studied, *viz.*, atm. oxidation in Cu cylinders and oxidation in a medium of O, lead in general to similar classifications of oils with respect to their tendency to form sludge. Oxidation in a medium of O, however, gives results which distinguish the oils better one from another. In the method of oxidation with air the acid content was too low. There was no relation apparent between the 2 methods described and the "life test." The latter and the method of oxidation in O at const. pressure seemed in conjunction with one another to classify oils in the order of their resistance to deterioration, the "life test" giving a measure of the resistance of an oil to form a sludge, and oxidation in O at const. pressure giving a measure of the velocity of this sludge formation and the accompanying formation of acid. C. C. Davis

Fundamental viewpoints in judging the resistance of insulating oils against oxidation. S. Fachini and C. Borella. *Chem. Umschau Fette, Oele, Wachse u. Harze* **34**, 331–4(1927).—All tests have the following procedure in common: the oil is heated to a certain temp. for a given length of time; the reaction products are detd. and they furnish a clue as to the quality of the oil. The following points are discussed: (1) *Temp.*—It varies between 100° and 175°; the most generally accepted temp. is 110°. (2) *Heating.*—The covered thermostat is preferable to an exposed oil surface on account of the variability of air currents. (3) *Vessel.*—Metals act as oxidizing catalysts to a varying degree; glass less so; the same type of vessel must be used to obtain comparable results. (4) *Oil.*—The quantity employed varies between 10 g. (French method) and 1000 cc. (Swiss method). The ratio of oil vol. to exposed surface dets. the speed of reaction; a small surface is recommended to prevent too rapid and uneven oxidation. (5) *Catalyst.*—The presence of an oxidizing catalyst, Cu in gauze or sheet form, is preferred for reproducible results; its total surface is of secondary importance. (6) *Air.*—The passing of air or O_2 through the oil shortens the time but burdens manipulation; it is unnecessary when Cu is present. (7). *Electrostatic field.*—The present information on this point is quite vague. (8) *Time.*—It varies between 5 hrs. and 25 days. Its length is arbitrarily selected; the Italian standard of 300 hrs. yields sufficient oxidation products for accurate detns. (9) *Oxidation products.*—This is the most important consideration. The change in color is no criterion of quality but gives a safe guide as to the origin of the oil; darkened oils result from American (paraffin) oils; light colors from Russian (naphthene) oils. The depth of color is not proportional to the amt. of sediment or to the amt. of acids formed. Total sediment (insol.

in standard benzine) and total acids (the intermediate product) must both be detd.; omission of one of the two furnishes an incomplete picture. The action of the oil upon cotton fiber is only of informative character without abs. value. P. ESCHER

Manufacture of insulating oils. TYPKE. *Allg. Öl u. Fett-Ztg.* **24,** 552–3; *Chem. Zentr.* **1927,** II, 2635; cf. *C. A.* **22,** 159, 863.—Useful insulating oils have been obtained only from petroleum, except for the expensive rosin oils. As to the triaryl phosphates manufd. by the I. G. Farbenind., it must be noted that they are heavier than H_2O, so that H_2O in the oil might rise to the surface and cause a discharge. G. SCHWOCH

Renovation of used lubricating oils. K. HORNSTEIN. *Seifensieder-Ztg.* **53,** 910 (1926).—H. replies to Typke (*C. A.* **22,** 863), showing that in practice the assembling of used lubricating oils and their subsequent purification and distn. present greater difficulties than is anticipated by T. P. ESCHER

Determination of water in oils and tar. ANTONIO VALENTE DO COUTO. *Chimica Industria* **3,** 462(1928).—For oils, contg. about 3–5% water, which cannot be detd. in the usual way by a fractional distn., the following method is recommended: in an Engler flask, connected to a condenser, heat 50 cc. of a high-boiling, water-free mineral oil near its boiling temp. Dil. 50 cc. of the emulsion to be examd. with 50 cc. of a light hydrocarbon (with tar benzene may be used) and add drop by drop. Collect the evapd. and condensed water in a graduated tube, contg. the same solvent as used to dil. the emulsion; the water forms a sep. layer and its vol. is read directly. Moisture not in emulsion, but simply adsorbed, is easily detd. by shaking the oil with H_2SO_4. R. D. BUMBACHER

Heat transfer in oils flowing through pipes. M. GARCIA. Gulf Refining Co., Port Arthur, Tex. *Ind. Eng. Chem.* **20,** 889–91(1928).—Methods commonly used for the calcn. of heat transfer rates are satisfactory for H_2O and gases, but for oils and other highly viscous liquids the variables involved require certain modifications. The sp. heat of gases and liquids is a function of the temp., and the transfer coeffs. depend on the phys. properties of the fluids that vary with the temp. For petroleum these variations are of such order that the assumption of constancy is not justified; therefore a new expression for "mean temp." must be derived. Thus for heat transfer between a liquid in a pipe and the wall, when the wall temp. is const., let dS be an element of surface of the pipe wall, and dt the differential change in temp. of the liquid flowing past the surface, then $wcdt = -(T - t)dS/r$, where w = wt. of liquid flowing per unit time, c = sp. heat, T = pipe wall temp., t = liquid temp., and r = thermal resistance of liquid film. This gives $S = -w\int_{t_1}^{t_2} \frac{rcdt}{T - t}$, representing the law of temp. variation along the pipe. From the work of others G. derives values for r, c and exptl. consts. involved in applying this formula in practical work. Graphical methods are given for the calcn. of mean liquid temps. and mean temp. differences to be used in the correlation of exptl. data or the design of exchangers for heavy viscous oils involving large temp. ranges. The method of calcn. is illustrated by specific instances from every-day work. W. C. EBAUGH

The spreading of lubricants on solid surfaces. PAUL WOOG. *Ann. office nat. comb. liquides* **3,** 271–3(1928).—See *C. A.* **22,** 1231. R. E. SCHAAD

Comparative tests of two mazouts under a steam ship boiler. G. U. KOZLINSKII. *Izvestiya Teplotekh. Inst.* (*Bull. Inst. Fuel Research* (*Russia*)) **1926,** No. 1, 56–83.—The characteristics of the mazouts used are, for Grozny paraffin mazout: sp. gr. 0.896, cold test (Holde) 30°, paraffin wax 9.07%, max. calorific value 10,760 kg./cal., compn.: C 85.80, H 12.81, O and N 0.25, ash 0.0, S 0.21, H_2O 0.93%, min. calorific value 10,065 kg./cal., compn. of the ash and water-free part: C 86.61, H 12.93, O and N 0.25, S 0.21%, min. calorific value 10,166 kg./cal. Corresponding values for the other mazout are: 0.910, uncertain, none, 10,104, 81.10, 11.86, 0.70, 0.04, 0.16, 6.14, 9399, 86.45, 12.64, 0.074, 0.17 and 10,057. The Grozny mazout was warmed by a steam coil before being sent to the oil burner; the other mazout was used at ordinary temp. The atomization of fuel in both cases was carried out with steam, the Grozny mazout consuming more steam, which disadvantage was made good by its higher calorific value. 977,000 cal. were required to keep the Grozny mazout at about 40° for 157 hrs. The upkeep expenses for Grozny mazout were 1% higher than for the other, owing partly to a low outside temp. (1°), whence 1^1/$_2$% more steam was generated. No coke or soot formation was noticed. The Grozny mazout can be used accordingly with the same results as with paraffin-free mazout. A. A. BOEHTLINGK

So-called pitch number of oils. S. GASIOROWSKI AND S. PILAT. Polytech. Lwow. *Przemysl Chem.* **12,** 235–9(1928).—Pitch no. can give no satisfactory indication of the

kind of cylinder oil a given raw material will produce. On heating different oils at 200° for 2 hrs. those oils which originally had a low asphalt content scarcely increased it at all, and those with higher asphalt content, 0.14% and 1.28%, increased it by 70% to 300% regardless of the pitch no. A. C. Z.

The determination of tar number of oils. H. v. d. Heyden and K. Typke. Chem. Lab. A. E. G. Transformatoren-fabrik Berlin-Oberschöneweide. *Chem.-Ztg.* **52,** 150 (1928).—It has been proposed by Marcusson and Bauerschäfer (*C. A.* **20,** 2743) to det. the tar no. of an oil by heating 50 g. oil in the presence of 10 g. pumice soaked in NaOH at 120° for 24 hrs. in a 200-cc. flask, instead of the usual procedure (referee method) consisting of heating 150 parts by wt. of oil in a 300-cc. flask for 70 hrs. at 120° in a current of O_2. By an examn. of 5 types of oil, H. and T. conclude that there is no basis for substituting M. and B.'s method for the referee method. The former method gave much higher results than the latter. J. H. Perry

The determination of asphalt in paraffin oils. J. Mžourek. *Paliva a Topení* **10,** 1–3(1928).—Five g. oil are placed in an Erlenmeyer flask and refluxed with 40 times its vol. of normal benzine for 2–3 hrs. The liquid is cooled 1/2 hr., decanted and filtered. The pptd. asphalts are washed with normal benzine. From here the analysis follows the cold method of Holde. The described method reduces the total analysis to 4 hrs., removes asphalts very completely (the filtrates remain colorless for several days), and yields results comparable to other methods. The grades of benzine used had no effect upon the results. A résumé in French follows. Frank Maresh

Asphalt-precipitating benzine. H. Burstin and J. Winkler. Lab. of Refinery "Galicja," Drohobycz, Poland. *Przemysl Chem.* **12,** 445–63(1928).—The object was to prep. from Polish raw materials benzine suitable for pptg. asphaltines from mineral oils which would conform to the specifications of D. Holde (*Wasserstoffole u. Fette,* p. 135). Gasoline and cracked benzine yielded products superior to Kahlbaum's standard. On this basis, new specifications are drawn up for pptg benzine: d_{15} 0.685–0.695; b. p. limits 65–95°; refinery no. up to 2%. New addns. to the old specifications are recommended: aniline point over 64°; n_{20} under 1.3950; 65–80° fraction must represent no more than 70% benzine; 80–95° fraction must have d_{15} below 0.700, and n_{20} below 1.4000. A. C. Zachlin

Asphalt. Prévost Hubbard. *Mineral Ind.* **36,** 49–55(1927).—A discussion of asphalt varieties, production, imports and exports, etc. A. B.

Determining ceresin in ozocerite and in paraffin tars. V. Tokmanov. *Neftyanoe Khozyaistvo* **12,** 558–61; *Chem. Zentr.* **1927,** II, 1525; cf. *Neftyanoe Khozyaistvo* **12,** 414.—The ozocerite dissolved in benzine is heated 1.5 hrs. at 60–5°, with sulfosil (activated silica gel). The part not retained is ceresin. Applied to crude ozocerite, the method gives higher contents of ceresin than does the method of Lach (Die Ceresinfabrikation 60(1911); *C. A.* **5,** 2533), but applied to ozocerite from which the volatile components have been removed the method gives lower contents of ceresin than does the Lach method. In the Lach method, which employs a temp. of 200°, light hydrocarbons, which are not absorbed by the sulfosil, are lost, but on the other hand the removal of resin from the ozocerite is more complete by sulfosil. Silica gel and Florida earth absorb less than sulfosil because they retain especially the resins already present, which accelerate only slightly the polymerization of unsatd. compds., while sulfosil polymerizes and retains all substances which form resins. If ozocerite is treated first with silica gel and then with sulfosil, resins, compds. tending to form resins, and ceresin can be sepd. C. C. Davis

Analysis and purification of sulfate turpentine. I. Y. Postovskii and V. G. Plyusnin. *Ann. inst. polytech. Oural* **6,** 245–59(1927).—The authors have investigated the possibilities of purification of raw turpentine oil obtained as a by-product in the tech. prepn. of cellulose by the sulfate method. Such turpentine contains considerable quantities (10–12%) of methylmercaptan, methyl sulfide and of other mercaptans and sulfides, which all must be removed before turpentine can be used for chem. and other purposes. As possible methods of purification P. and P. suggest a careful oxidation of the impurities. A method which can be more advantageously employed in technic is a fractionated steam distn. Distn. of 15% of the raw material removes 86% of all impurities yielding a ppt. with $HgCl_2$. On distn. of 50%, only 2% of mercaptan, etc., remain in the turpentine. These last traces are preferably oxidized by a very weak soln. of chlorinated lime. The oil so purified has the following consts.: 90% boils between 153.5° and 165°, d_{15} 0.8645; n_D^{20} 1.4672; Br no. 2.0. About 45% of the purified oil boils between 153° and 155° and consists of practically pure α (and β) pinene. G. B. Kistiakowsky

Report of Committee D-7 on timber. HERMANN VON SCHRENK, *et al. Proc. Am. Soc. Testing Materials* (preprint) **75**, 8 pp.(1928).—The Com. recommends that the tentative method for distn. of creosote oil (D 246–267) be adopted as standard with slight revision as to asbestos cover. A slight change is recommended in creosote sp. gr. detn. in the standard method of sampling and analysis of creosote (D 38-27). The comm. is coöperating with the Bur. of Standards in the prepn. of a table for correcting the d. and vol. of creosote and creosote coal-tar mixts. from observed temp. to standard temp. These detns. are being made by the Bur. in 100 ml. pycnometers. The temp. is detd. with Pt resistance thermometers and the bath is thermostatically controlled to within 0.005°. Readings range from 40° to 100° in 10° steps. The calcd. av. rates of vol. change per 1° at range 40° to 50° and at range 70° to 90° are: creosote 0.00071 and 0.00075, resp.; creosote coal-tar soln. 0.00070 and 0.00072; water gas-tar creosote 0.00073 and 0.00076; water gas-tar soln. 0.00071 and 0.0075. Interpolated tables are being prepd. An historical résumé of expansion coeffs. used in the U. S. is included.
ALFRED L. KAMMERER

Studies in gas generator tar from wood. I. YA. POSTOVSKII, N. A. APOLLOV AND B. P. LUGOVKIN. *Ann. inst. polytech. Oural* **6**, 241–4(1927).—The authors have carried out a partial analysis of tar obtained in an industrial gas generating plant mainly from wood of conifers. This tar is characterized by its high content in water (50%) and in resinous substances insol. in ether (up to 40%). Besides *p*-cresol and *p*-ethyl phenol, 2 other phenols were isolated, one of which, not identified, has m. p. 234–235°, C 72.87%, H 6.24%; the other is probably derived from dimethoxy-*p*-xylene. A hydrocarbon $(C_8H_6)_n$ has also been isolated. It is unsatd., gives a blue-color reaction with cold, and a green one with warm, H_2SO_4, being sol. in both, has an odor similar to that of naphthalene, is of greenish yellow color; m. 87–88°. It is suggested that this hydrocarbon belongs to the group of fulvenes, being perhaps $C_{16}H_{12}$, naphthylfulvene.
G. B. KISTIAKOWSKY

Indications of petroleum at Sundgau (JUNG) **8.** Analysis of mixtures of hydrocarbons by means of their refractive dispersion (MOUTTE) **10.** Utilization of brown coals and bogheads of Irkutsk area, Siberia (MINAEV) **21.** Cholesterol as the mother substance of petroleum (ZELINSKII, LAVROVSKII) **8.** Activated silica gel (Sulfosil) (TUICHININ, TOKMANOV) **18.** Theory of petroleum formation. Conclusions to be drawn from the composition of Cheremchovskii boghead coal (STADNIKOV, IVANOVSKII) **8.** Dehydrating and distilling oils (U. S. pat. 1,685,034) **21.** Bituminous compositions (Brit. pat. 284,246) **20.** Apparatus for low-temperature distillation of wood, oil shale (U. S. pat. 1,685,496) **1.** Countercurrent filtration system for oil (U. S. pat. 1,686,092) **13.** Safety vapor outlet for containers holding petroleum (U. S. pat. 1,686,918) **1.** Resolving emulsions of tar or oil (U. S. pat. 1,687,314) **21.** Lubricating compositions (Brit. pat. 285,473) **27.**

Cracking petroleum oils. JOSEPH G. ALTHER (to Universal Oil Products Co.). U. S. 1,685,476, Sept. 25. The oil is passed through a coil of progressively decreasing size in a heating zone in which the diam. of the coil decreases in accord with a lowering temp. in the heating zone; the oil is discharged from the smallest portion of the coil into a vapor chamber from which vapors may be led to a dephlegmator and condenser. An app. is described.

Recovery of gases and vapors from petroleum. ROBERT T. OSBORN (to Standard Oil Co. of Calif.). U. S. 1,685,501, Sept. 25. Gases such as those produced by distg. petroleum and which are substantially uncondensible at atm. temp and pressure are passed (unaccompanied by vapors condensible at or below the pressure and temp. at which the gases can be condensed) into vapors from a distg. unit operating below cracking temp. and pressure to convert high b.-p. oil into vapors which are condensible at atm. temp. and pressure and which contain substantially no constituents of which the gases are composed. A vapor condition is thus created such that substantially all of the vapors and gases can be condensed at atm. temp. and pressure, without change in the mol. state of the gases, and condensation is then effected. An app. is described.

Paraffin from petroleum. EVERETT R. WILES. U. S. 1,684,426, Sept. 18. In order to recover amorphous paraffin of high m. p. from petrolatum, the latter is treated with a mixed solvent contg. acetone 35 and C_6H_6 65%, and the soln. formed is cooled and the paraffin sepd. from it.

Continuous counter-current system for treating petroleum with acid, alkali or other immiscible reagents. RALPH A. HALLORAN (to Standard Oil Co. of Calif.). U. S. 1,684,489, Sept. 18. An app. is described.

Cracking hydrocarbons. Eugene H. Leslie and Edwin M. Baker. U. S. 1,684,771, Sept. 18. Superheated hydrocarbon vapors from a vapor phase cracking plant are conducted into the lower part of a fractionating column and brought into counter-current contact with a liquid condensate. A substantial portion of the vapors leaving the column are refluxed into its upper part and used in the counter-current treatment. An app. is described.

Cracking hydrocarbon oils. E. S. Andrews (to B. Ormont Associates, Inc.). Brit. 285,199, Dec. 11, 1926. Oil under treatment, after partial vaporization (suitably in a tube furnace) is brought into a portion of the app. (which is described) where steam is being generated, to effect vaporization and cracking of the heavier ends of the oil. Cracking temps. and pressures may be used and the furnace tubes may be formed of alloys contg. Si, Fe and in some cases Ca, which have a catalytic action in forming light hydrocarbons.

Cracking hydrocarbon oils. H. Carroll. Brit. 284,345, Jan. 28, 1927. Oil is heated in pipe coils in a furnace to slightly below the cracking temp., the vapor produced is sepd. from liquid in a dephlegmator and the liquid is then further passed to a converter or cracking app. comprising a series of heated annular troughs filled with fusible metal or alloy and over which the oil successively flows as it descends on the exterior of a heated truncated cone on which the troughs are mounted. Various features of app. are described.

Cracking hydrocarbon oils. Lyman C. Huff (to Universal Oil Products Co.). U. S. 1,685,488, Sept. 25. Oil is continuously passed in a restricted stream through an elongated conduit such as a pipe coil within a furnace and a superheated inert gas or vapor such as superheated steam is introduced into successive sections of the conduit under pressure and velocity greater than those of the oil stream, to "step up" the flow of the oil stream through the conduit. An app. is described. Cf. *C. A.* **21,** 1348.

Cracking hydrocarbon oils. C. P. Dubbs. Brit. 284,507, April 29, 1927. Oils are heated under pressure in tubes in a furnace, to a cracking temp., and are then passed to a reaction chamber under reduced pressure, when vapors pass to a dephlegmator and condenser. Incondensible gases are further heated, in a sep. furnace, to a temp. higher than that at which the oil was first heated and then injected into the liquid in the reaction chamber. The app. is described. Cf. *C. A.* **22,** 2462.

Conversion of hydrocarbon oils. Carbon P. Dubbs (to Universal Oil Products Co.). U. S. 1,686,654, Oct. 9. A mass of relatively heavy hydrocarbon oil is heated to a cracking temp. above the b. p. of the complex chem. constituents of the heavy oil under sufficient pressure to prevent vaporization of these constituents; this heated oil is then introduced into a zone of lower pressure in such manner as would permit vaporization of the constituents mentioned and dissocn. of the oil is checked by regulated introduction of a cooler mass of hydrocarbon oil into contact with the heated oil substantially at the point of its vaporization. An app. is described.

Converting hydrocarbon oils to oils of lower boiling point. Frederick Lamplough. Can. 283,681, Oct. 2, 1928. The oil is mixed with a normally solid cyclic hydrocarbon as naphthalene and heated to 300° to 400° under a pressure higher than the vapor pressure of the oil at the temp. employed, then cooled to a temp. such that the heavier portion of the hydrocarbons will remain in a liquid state but the lighter portion formed will be vaporized upon release of the pressure. Then the lighter hydrocarbons are sepd.

Purifying hydrocarbon oils. Warren K. Lewis (to Standard Oil Development Co.). U. S. 1,686,493, Oct. 2. Oil is agitated with fuller's earth or other suitable adsorbent material in a succession of units (of an app. which is described) and the oil is passed successively from one unit to another; the oil is then removed from the adsorbent material and the latter is washed with naphtha, dried by a current of naphtha vapor, steam or other hot gaseous drying fluid; and fresh adsorbent material is supplied to replace spent washed and dried material.

Distilling hydrocarbon oils. Frank A. Howard (to Standard Oil Development Co.). U. S. 1,686,490, Oct. 2. A distn. vessel is heated by contact with molten material such as Pb or its alloys during operations such as distn. and cracking and as soon as the distn. is completed the vessel is moved out of contact with the molten heating material.

Oil refining. Sijbren Tijmstra (to The Simplex Refining Co.). Can. 283,795, Oct. 2, 1928. Hydrocarbon oils are treated with an alkali metal plumbite in a water soln.; the plumbite soln. is sepd. from the oil; the oil is treated with an alkali metal polysulfide; and then the polysulfide soln. is removed. Cf. *C. A.* **22,** 4242.

Fuel oil from liquid residuum of hydrocarbon oil distillation. Wayne S. Hughes

and JAMES HARROP (to Standard Oil Development Co.). U. S. 1,686,491, Oct. 2. The liquid residue obtained from distg. petroleum after adding NaOH or similar processes may be emulsified with water and gas oil, the emulsion afterward broken by addn. of acid material such as H_2SO_4 and the aq. layer contg. inorg. matter to be sepd. is withdrawn from the layer of oil. An app. is described.

Nitrogenous bases from hydrocarbon materials. HARRY K. IHRIG (one-half each to Sumner E. Campbell and Associated Oil Co.). U. S. 1,686,136, Oct. 2. A crude gasoline such as may be obtained from first distn. of a petroleum oil is treated with a reagent such as 25% H_2SO_4 to form compds. with the nitrogenous bases present, the reaction products are sepd., *e. g.*, by counter-current flow, and are made alk. and subjected to distn. to sep. nitrogenous bases of 2 types, sol. and insol. in water, and these are then sepd. from each other by their differential solubilities. They may be used in *insecticides* or for other purposes. Cf. *C. A.* **22**, 2661.

Catalytic or other production of liquid hydrocarbons. F. J. M. HANSEN. Brit. 284,224, Jan. 24, 1927. At. H is caused to act upon C or upon hydrocarbons such as vapor of naphthalene (which need not be pure), without pressure and with or without use of a catalyst. The H may be dissocd. by an elec. arc or hot spark discharge and used immediately after its dissocn.

Reclaiming oil. GEORGE L. CHERRY (to The DeLaval Separator Co.). Can. 283,744, Oct. 2, 1928. Used oil contg. water and solid impurities is heated to nearly the boiling point of water and mixed with 1–3% solid NaOH. It is settled while hot to ppt. the impurities; the supernatant oil is drained off, clean water is added and the last traces of solid impurities and NaOH are removed by centrifuging.

Causing flow of oil through pipe lines. LOUIS W. SOUTHGATE. U. S. 1,686,475, Oct. 2. The oil is sucked along at one end of a section of the pipe line, air or gas is permanently removed from the system, and the oil is forced along the next section. An app. is described.

Preventing oxidation of oils by air. F. HOFMANN and M. DUNKEL. Brit. 284,616, Nov. 24, 1925. To protect oils such as those used for lubricating or in transformers from action of air, especially when the oil is heated, they may be mixed with 0.1% of urea or with small quantities of other suitable basic org. N compds. such as bases, nitriles, oxamides and derivs.

Extracting oily bases from crude shale oil. DAVID T. DAY. U. S. 1,685,315, Sept. 25. A body of crude shale is first treated with a dil. inorg. acid soln. such as H_2SO_4 and the acid soln. contg. the oily bases is sepd. from the oil and neutralized with lime or other suitable alkali to effect pptn. of the bases, the oily bases are collected apart from the alk. soln., the pptd. bases are treated with an inorg. acid and the resultant mixt. is treated with an alkali to effect neutralization and is agitated with a hydrocarbon solvent such as gasoline and the resulting soln. is drawn off from the alk. aq. soln. and the oily bases are extd. from the soln. with H_2SO_4, HCl or other suitable inorg. acid soln.

Apparatus for gravity separation of oil from water. DEUTSCHE WERFT A.-G. Brit. 285,350, Feb. 25, 1927.

Gas separator for crude mineral oil. A. G. KHARNASON. Russ. 4347, Jan. 31, 1928.

Detergent preparations from mineral oils. G. S. PETROV. Russ. 4300, Sept. 15, 1924. Sulfonic acids obtained from mineral oils or crude oil distillates are sapond. with caustics or NH_3 or alkali carbonates with or without the addn. of fats or fatty acids.

Reconditioning electric insulating mineral oil. CLARENCE J. RODMAN and MAX HECHT. U. S. 1,685,681, Sept. 25. The oil is evacuated and then treated with an adsorbent such as prepd. charcoal, SiO_2 or a filter clay which also has been evacuated; this treatment is effected out of contact with atm. gases and the oil is then filtered to remove the adsorbent while still maintaining it out of contact with atm. gases. An app. is described.

Improving motor fuel. ALLGEMEINE GES. CHEM. IND. M.B.H. Fr. 635,570, June 7, 1927. Gasoline is fractionally distd.; the fraction distg. up to 160° is sepd. (part A); and the fraction distg. above 160° is extd. with agents, such as liquid SO_2 or acetone, which dissolve to a great extent the unsatd. but not the satd. hydrocarbons. The extg. agent is sepd. and this fraction added to part A.

Filter for internal-combustion motor fuel. SOCIÉTÉ ANON. DES NOUVELLES INVENTIONS MÉCANIQUES ET ÉLECTRIQUES. Fr. 635,161, Sept. 30, 1926.

Material for preventing detonations in internal-combustion engine cylinders. E. SOKAL. Brit. 285,145, Nov. 11, 1926. A carbonate of Pb, Cu, Ca, Mg, Na or K

(or a substance which is converted into one of these carbonates during the operation of the engine) is mixed with a binder such as a silicate and used for coating the walls of engine cylinders or the heads of pistons. Several coatings may be successively applied and baked. Cf. *C. A.* **21**, 3454.

Transformation of methane into gasoline or the like. ACHILLE GOUDET. Fr. 32,666, May. 26, 1926. Addn. to 613,146. Methane is treated with Ni, Fe or Co or their compds. at a pressure up to 1000 kg. per sq. cm., the migration of the H being facilitated by the addition of alkali or alk. earth metals or of Cl, Br, I, S, Se, Tl. The methane may be mixed with Hg vapor and submitted to an elec. field giving a difference of potential.

Vent pipe and associated liquid seal for gasoline storage tanks, etc. HAROLD V. ATWELL (to Standard Oil Co. of Ind.). U. S. 1,685,516, Sept. 25. Structural features.

Coating for gasoline tanks. H. H. EVANS. Brit. 285,149, Nov. 11, 1926. A coating for the exterior of tanks is formed of glycerol 39.5, fish-glue 48, glucose or molasses 1.5 and water 11 parts.

Tape formed of paper or other "soluble" material, for use in measuring the depth of wells in well drilling. CLINTON H. M. BULL (to Reed Roller Bit Co.). U. S. 1,686,-956, Oct. 9. In use, a tape formed of paper or other "sol." material is used which after use disintegrates in the oil or water in the well.

Fat-like products from sapropelites. D. A. SHVEDOV. Russ. 4161, Sept. 15, 1924. Sapropelites are oxidized by HNO_3 or other oxidants.

Removing amorphous wax and asphaltic material from oil. THOMAS CLARKSON and HAMMOND R. HEAL. U. S. 1,686,437, Oct. 2. A light petroleum distillate is added in sufficient quantity to lower the viscosity of the oil and the soln. is then refrigerated to cause solidification of a substantial portion of the amorphous wax and asphaltic material; the soln. is filter-pressed through material of a texture at least as fine as that of filter paper and after solidified material has accumulated on the filtering medium it is removed by a hot solvent.

Slack wax. BENJAMIN L. SOUTHER and WILLIAM A. GRUSE (to Gulf Refining Co.). U. S. 1,685,008, Sept. 18. A magma of solid slack wax contg. oil is comminuted to a fluent consistency and the liquid and solids are mech. sepd., *e. g.*, by pressing.

Slack wax. BENJAMIN L. SOUTHER and WM. A. GRUSE (to Gulf Refining Co.). U. S. 1,685,058, Sept. 18. Solid slack wax is comminuted to a fluent consistency and a solvent liquid such as *n*-BuOH is added which has a preferential solvent action on the oil; solid components and liquid components of the material are then mech. sepd. from each other, *e. g.*, by filter-pressing or centrifuging.

Rotating device for testing lubricants. ARMEN E. BECKER. U. S. 1,686,365, Oct. 2. An elec. device is provided for detg. the thickness of the oil film under different pressures, etc.

Edge filter for lubricating oil, etc. METAL EDGE FILTER CORP. Brit. 285,127, Nov. 9, 1926. Structural features.

Filter sheets made of fabric for filtering lubricating oil of engines, etc. C. W. MCKINLEY (to A. C. Spark Plug Co.). Brit. 284,982, Feb. 5, 1927.

Asphalt emulsions. W. H. SCHMITZ. Brit. 284,330, Jan. 29, 1927. Asphalt emulsions are prepd. with use of alk. solns. of bleaching powder or bleaching powder residues from lubricating oil refining or the like. Other acid or alk. residues from oil refining, as well as stabilizers such as starch, gums or soap may be added, and the materials are heated in forming the emulsions.

Apparatus (with a retort mounted on trunnions) for carbonizing and distilling wood. RAPHAEL MALBAY. U. S. 1,684,875, Sept. 18. Connections are provided for burning gas led from the retort in an annular chamber surrounding the retort.

Distillation of wood. HERMANN SUIDA. Austrian 109,173, Nov. 15, 1927. The distn. products are freed from tar and treated in the vapor phase with cresol or other high-boiling solvent for AcOH, the treatment being carried out in a column at a temp. above 100°. The residual vapors are cooled to 70–90° to remove water and traces of acid and solvent, and are then further cooled to condense the wood spirit.

23—CELLULOSE AND PAPER

CARLETON E. CURRAN

Progress in the cellulose industry. WALTER PETERS. *Apparatebau* **40**, 218–9 (1928).—A brief outline of improvements in methods and equipment. J. H. MOORE

Röntgen spectrographic observations on cellulose. R. O. HERZOG AND W. JANCKE.

Kaiser Wilhelm Inst. für Faserstoffchemie. *Z. Physik.* **49**, 27–30(1928); cf. *C. A.* **22**, 3986.—The well-known splitting of certain spots in the fiber pictures of cellulose is shown to be due to the exptl. set-up and not to a distortion of the cellulose lattice or a second component. Pictures taken with very narrow defining holes and with a monochromatic beam, deflected from a calcite crystal, show no such splitting. Using a narrow slit for the rear definition and a circular hole for the forward definition of the beam, the equatorial spots are split when the fiber axis is perpendicular to the slit, and the vertical spots (the sample being inclined to the beam) are split when the specimen and slit are in the same plane. Thus divergence and heterogeneity of the beam are the causes of this splitting. The indentity period is 10.35 A. U. R. L. HERSHEY

X-ray methods in determining structure of cellulose fibers. Organomolecular investigations. O. L. SPONSLER. Univ. of Calif., Los Angeles. *Ind. Eng. Chem.* **20**, 1060–2 (1928).—A general agreement, based largely on x-ray studies, has been reached with respect to the character of the structure of cellulose. The long, primary valence chains appear to be well established, but agreement has not been reached with regard to some of the details. Many of the difficulties are due to the fact that the natural fibers have a gross structure, the result of their growth, which makes it impossible to obtain reflections from any one set of planes considered crystallographically and from these planes alone. The best that can be done is to arrange the fibers as nearly parallel as possible into a small bundle 3 or 4 mm. thick. A section 3 or 4 mm. long is then cut from this bundle, and used as the sample for x-ray study. By mounting this on a protractor, the x-ray beam may be passed through this at known angles with reference to the fiber axis. A complete set of diffraction patterns consists of about 10 photographs taken at different angles. Conclusions as to the compn. of planes must take into consideration the intensities of the lines, but such conclusions are in some doubt because of the many factors involved. A. W. KENNEY

The self-recording strength tester. FRITZ RÜHLEMANN. *Papierfabr.* **25**, Tech.-Wiss. Teil 577–81(1927).—The Rühlemann app. for detg. the tensile strength, stretch and elasticity of single fibers photographically is described. J. L. PARSONS

Remark on the note: New light on the form of molecules of cellulose and polymers by J. R. Katz and P. J. P. Samwel. R. O. HERZOG. *Naturwissenschaften* **16**, 673 (1928); cf. *C. A.* **22**, 3986.—Barton and Hunt (*C. A.* **19**, 753) have already made expts. in agreement with the recent results of K. and S., finding a complex of less than 10 A. U. size. B. J. C. VAN DER HOEVEN

Changes in cellulose induced by acid sulfite treatment. ERIK HAGGLUND AND F. W. KLINGSTEDT. Woodchem. Inst. Åbo. *Svensk Kem. Tids.* **40**, 181–8(1928) (In German).—Cotton was digested in sealed tubes at 130° with sulfite liquor contg. 45% SO_2 and 0.8% CuO. Tubes were opened at hourly intervals for analysis. Ash in the fiber increased from 0.2 to 5.1%. The Cu no. increased from 1.2 to 3.9. α-Cellulose decreased 43% the first hr. and 27% the following 14 hrs. 1.9% sugar was found in the liquor. More sugar would have formed had the liquor been more acid. Cotton autoclaved in 8% $NaHSO_3$ and 0.2 *N* HCl gave a fiber product with 2.1 Cu no. and 76% α-cellulose. 1.6% sugar was found in the liquor. This prepn. pptd. from NaOH soln. by AcOH and redissolved by NH_3-NaOH-$Cu(OH)_2$ gave the same $-\alpha_D^{20}$ curve as Hess' cellulose A (*C. A.* **18**, 1384). H. and K. concur in conclusions of Hess with respect to formation and identity of cellulose A and α-cellulose. A. R. ROSE

The prolonged action of caustic soda solution on cellulose and its practical and theoretical importance. R. HAZARD. *Russa* **3**, 245–51(1928).—A brief review. A. PAPINEAU-COUTURE

Present status of our knowledge of the intimate structure of cellulose fibers. R. MICHEL-JAFFARD. *Chimie et industrie* **19**, 801–8, 1003–12(1928).—A review with bibliography of 53 references. A. PAPINEAU-COUTURE

Hydrated cellulose. JOSEPH ROSSMAN. *Paper Trade J.* **87**, No. 7, 61–2(1928).—A review of U. S. pats. relating to the gelatinizing or hydrating of pulp by mech. and chem. means. A. PAPINEAU-COUTURE

The action of ultra-violet rays in the bleaching of cellulose. RENÉ ESCOURROU. Papeteries Navarre. *Chimie et industrie* **19**, 989–97(1928).—The action of ultra-violet rays on paper pulp in hypochlorite bleaching, H_2O_2 bleaching, treatment with 4% NaOH and treatment with 5% H_2SO_4 was investigated, the expts. being carried out on strong unbleached sulfite, soft unbleached sulfite, easy-bleaching sulfite, sulfite pulps prepd. from knots and from wood flour, uncooked pulp sepd. from good fibers in the rifflers, and spruce groundwood. The effects of the rays were estd. by detg. the Cu no., α-cellulose and in some cases β- and γ-celluloses. The presence of ultra-violet rays in bleaching with H_2O_2 or in the treatment of pulp with dil. NaOH or H_2SO_4 is

without effect; in $CaOCl_2$ bleaching it considerably increases the Cu no. and β- and γ-cellulose contents, and reduces the α-cellulose content. In the knot pulp presence of ultra-violet light did not exert a deleterious action, even in $CaOCl_2$ bleaching, presumably because the Cl reacts more readily with the ligneous constituents than with the cellulose; but the wood flour pulp and raw pulp were considerably deteriorated by $CaOCl_2$ bleaching in the presence of ultra-violet rays. A. PAPINEAU-COUTURE

Kress process of bleaching kraft pulp. O. KRESS. *Paper Trade J.* **87**, No. 9, 47–8(1928).—A description of U. S. pats. 1,645,061 (*C. A.* **21**, 4069) and 1,651,530 (*C. A.* **22**, 868). A. PAPINEAU-COUTURE

A micro-method for the determination of the copper number of cellulose. T. F. HEYES. *J. Soc. Chem. Ind.* **47**, 90–2T(1928).—The Braidy method (cf. *C. A.* **15**, 2360) gives better check detns. than the Schwalbe method for Cu no., and avoids the danger of auto-reduction. This method has been adapted to use a 0.25-g. sample of material. The solns. used are: (I) 150 g. Na_2CO_3 + 50 g. $NaHCO_3$; (II) 100 g. $CuSO_4.5H_2O$; (III) 40 g. $Fe_2(SO_4)_3.9H_2O$ + 100 cc. concd. H_2SO_4; each is made up to 1 l. with distd. H_2O. The sample is weighed into a test tube, which is fitted with a Pb wt. and closed with a glass pear; 9.5 cc. of I and 0.5 cc. of II are mixed, heated to boiling, and added to the sample. The tube is heated in a covered, boiling water bath for 3 hrs. with occasional stirring; pulp and Cu_2O are then collected in a Jena or Gooch crucible, and washed. The Cu_2O is dissolved with a total of 2.5 cc. of III, washed out of the pulp with 2 cc. portions of distd. H_2O, and the reduced Fe titrated with 0.04 N $KMnO_4$, a 2-cc. micro-buret graduated in 0.005 cc. being used. The end-point change, from pale green to colorless, is quite sharp. Blanks av. 0.025 cc. The results are in excellent agreement with those of the macro-method, on samples ranging from 0.20 to 4.58 Cu no. Such a micro-method has several advantages, especially for the *textile* chemist. R. H. DOUGHTY

Esterification of cellulose and cellulose esters. I. Velocity of nitration of cotton fiber. KATSUMOTO ATSUKI AND MASANORI ISHIWARA. Tokyo Imp. Univ. *Proc. Imp. Acad.* (*Japan*) **4**, 382–5(1928).—The nitration of cellulose as a fiber is governed 1st by the diffusion of the mixed acid, and 2nd by the progressive nitration of the HO groups in the mol.; the velocity of the nitration as well as the formation of the Me_2CO-sol. cellulose nitrate is expressed by formulas. **II. Decrease in viscosity of cellulose nitrate with the duration of nitration.** *Ibid* 386–8.—Cellulose nitrate gives a soln. of a lower viscosity as the time of nitration is increased; the relation between the decrease in viscosity and duration of nitration is expressed by the formula: $(a - y_1) = ae^{-Kz(c-nz)}$, where a is the assumed viscosity of the cellulose nitrate when the nitration period $z = 0$, $a - y_1$ is the viscosity obtained after the nitration for a period z, c and n are the consts., K is the velocity const. It is supposed that the decrease in viscosity is mainly caused by the depolymerization of the mol. aggregate of the nitrate during nitration. C. J. WEST

Investigation of the stability of cellulose esters. A. CAILLE. *Mon. produits chim.* **9**, No. 95, 5–8; *Chem. Zentr.* **1927**, II, 2542; cf. *C. A.* **22**, 2269.—Expts. on acetylcellulose esters are described, including their prepn., the purification of the acetylsulfonic acid esters with EtOH, lime water and distd. water, and their stability upon heating to 180°. Detns. were made of the free, combined and neutralized H_2SO_4, and of the total, free and combined AcOH. Very favorable results on stabilization were obtained by heating the esters for 1 hr. at 120° in an autoclave. C. C. DAVIS

Recent developments in solvents and plasticizers for cellulose esters. AUGUST NOLL. *Papierfabr.* **25**, Tech.-Wiss. Teil, 497–501(1927).—The phys. consts. and applications of the following compds. as solvents and plasticizers for cellulose esters are given: Me and Et glycols and their acetates, diethyl and Et Bu carbonates, Me and Et glycol esters of *o*-phthalic acid, Ph_2CH_2, Ph_2O, $MeC_6H_4SO_3Ph$, $PhCH_2OH$, *n*-PhEtOH, MeCOPh, $PhCH_2OAc$, amyl ester of salicylic acid, $MeC_6H_4SO_2NHPh$, 2,3-hydroxynaphthoic acid anilide. J. L. PARSONS

Cellulose formate. I. Formation [from hydrocellulose and cellulose regenerated from viscose]. Y. UEDA AND K. HATA. *Cellulose Ind.* (Tokyo) **4**, 1–2(1928).—Hydrocellulose with anhyd. formic acid and H_2SO_4 yields a product contg. 22.90% of formic acid (theory for monoformate 24.21%), while the product from cellulose regenerated from viscose contains 50.50% (cellulose triformate requires 56.09%). The ester is readily sol. in pyridine, but only sparingly sol. in other org. solvents. Results showing the effect of variations in the amt. of H_2SO_4 on the degree of esterification are given. B. C. A.

Constitution of cellulose xanthogenate. TH. LIESER. Techn. Hochschule München. *Ann.* **464**, 43–55(1928).—After attempts to synthesize cellulose xanthogenate (I)

from alkali cellulose and CS_2 failed, it was found that a pure product could be obtained by digesting the impure I with abs. pure MeOH; details are given of this method of prepn. The pure I retains the structure of the original cotton and has a very pale yellow color. Numerous analyses confirm the formula, $C_6H_{10}O_5.C_6H_9O_4.OC(:S)SNa$, thus supporting the view of Karrer and Vieweg and disproving the original view of Cross and Bevan. Using varying amts. of CS_2, at temps. from 0 to 22°, for 3–8 hrs., the resulting I showed S contents from 13.2 to 15.7 and Na from 7.7 to 8.3 (theory, S 15.1 and Na 5.45). While the pure I appears to suffer no change in 8% NaOH after 11 months yet there is a change of the cellulose into cellulose A, as indicated by its soly. in alkali and the Cu no. The same change takes place in the dry I on standing for 120 days. I with I gives the disulfide, pale yellow. MeI reacts with I, giving a product with scarcely any Na, about 33% of the original S content and with about 25% of the theory of Me content. $PhCH_2Cl$ behaves similarly. Metallic derivs. were obtained with $Cd(NO_3)_2$, $ZnSO_4$, $NiSO_4$, $CuCl_2$, $CrCl_3$, $FeSO_4$; $HgCl_2$ gives a *complex*, $I.2HgCl_2$.

C. J. West

Acetylation of cellulose with pyridine and acetic anhydride. Kurt Hess and Noah Ljubitsch. Kaiser-Wilhelm-Inst. Chemie, Berlin-Dahlem. *Ber.* **61B**, 1460–2 (1928).—All the methods hitherto known for the acetylation of cellulose (I) involve the use of catalysts (acids, salts of weak bases with strong acids, $ZnCl_2$-AcOH) which may themselves under certain conditions exert a powerful (hydrolytic) action on the I, and the conclusion has been reached that acetylation of I without an accompanying hydrolysis is impossible, but H. and L. have devised a method in which the hydrolytic influence is reduced to a min. or entirely done away with. The I fiber, purified as usual, is allowed to stand in 4 or 2 *N* NaOH (depending on whether it is a natural or an artificial product) for 1 hr. or 30 min., washed with H_2O to complete the disappearance of the alk. reaction, allowed to stand in excess of dry C_5H_5N which is renewed until the H_2O in the fiber has been displaced by the C_5H_5N, pressed as free as possible of the C_5H_5N, shaken 24 hrs. at room temp. with 10 parts Ac_2O and 16 parts C_5H_5N and finally placed in a bath at 40–5°. The temp. is gradually raised to 70° but it is possible that this is not necessary. The velocity of acetylation varies with the I. Viscose and Cu silk take up about 52.5% AcOH in 5 days and the reaction is complete or nearly complete (62.7% AcOH) in 30 and 34 days, resp. The cotton sample used took up about 40% AcOH in 5 days and this increased to 54.5% in 43 days (in another expt. 61.5%). Cellulose was almost completely acetylated in 52 days (61.1%). The resulting products were yellowish, the structure of the fibers was intact; after washing they could not be distinguished in color or appearance from the original material. Those contg. the quantity of AcOH calcd. for triacetylcellulose were, unlike all triacetylcelluloses hitherto described, completely or almost completely insol. in org. solvents. They swell to a limited extent in $C_2H_2Cl_4$, $CHCl_3$ and C_5H_5N. It should be remembered, however, that triacetylcellulose solns. are micellar in nature and represent the end stage or nearly the end stage of transitions from limited to unlimited swelling, so a difference in this respect must by no means have to be ascribed to a chem. difference. H. and L. are inclined to believe that the "insoly." of their triacetylcellulose is due to the complete preservation in it of the micellar structure of the original I. Probably the almost complete lack of dispersibility in org. solvents especially is also due to the fact that no products of acetolysis are formed in the reaction; numerous observations in the chemistry of I and related substances show that strikingly small quantities of foreign substances, if uniformly distributed, may have a great influence on the dispersibility.

C. A. R.

Cellulose sulfuric acid esters. Wilhelm Traube, Brune Blaser and Carl Grunert. *Ber.* **61B**, 754–67 (1928).—If well-dried cellulose (I) is placed in an atm. contg. a small quantity of SO_3 vapors, it combines, without charring, with 3 mols. of the SO_3 to form acid *cellulose trisulfate* (II), $(C_6H_7O_5(SO_3H)_3)$, which can readily be isolated in the form of well-characterized salts stable in the air. Detectable quantities of the acid mono- or di-sulfate are not formed even when the quantity of SO_3 present is far less than 3 mols. for each $C_6H_{10}O_5$ complex; the I not converted into II is recovered unchanged. Inversely, when more than 3 mols. SO_3 are present, there is at first formed only II, which then adds more SO_3, presumably in the same way that SO_3 adds to H_2SO_4 to form $H_2S_2O_7$; if the products are at once worked up in H_2O the excess of SO_3 is quantitatively split off as H_2SO_4. The products which have absorbed only about 3 mols. SO_3 can be cautiously neutralized directly with cold KOH; if more SO_3 has been absorbed it is better to dissolve in H_2O and remove the H_2SO_4 with a slight excess of $Pb(OH)_2$ or $PbCO_3$ and the Pb with H_2S and then neutralize with KOH. The exceedingly fine flocculent ppt. is centrifuged off, dissolved in a little warm water and allowed to

stand at 0°. The neutral *K salt A* (III), $C_6H_7O_5(SO_3K)_3$, so obtained (yield, about 65%) contains 12–4% H_2O which can be driven off at 100° in a high vacuum; it is tasteless, easily sol. in hot H_2O, in about 20 parts at 0°, is pptd. from H_2O by KOH as a greatly swelled mass, is insol. in EtOH and other org. solvents, shows under the ultramicroscope in water the characteristics of a colloidal soln., is completely amorphous both under the microscope and on x-ray examn. Its Cu no. (the no. of g. of Cu which 319 g. of anhyd. III ppts. as Cu_2O from a boiling alk. Cu soln.; on account of its great stability toward alkalies, the salt is practically unchanged by boiling with Fehling soln.; this Cu no. measures the reducing power of the salt itself, not of I split off from it) is 2.5–4.0 as detd. by the Schwalbe method by boiling 5 min. with Fehling soln. In water it shows $(\alpha)_D -5.5°$ to $-6.5°$, reacts neutral and can be boiled for a long time without change but in the presence of HCl gradually splits off H_2SO_4 quant. with formation of dark solns. having a strong reducing power corresponding to that of glucose solns. Toward alkalies it is very stable; even at 150°, KOH splits off only very little H_2SO_4. Its solns. give no ppt. with $AgNO_3$, a slight ppt. with $Pb(OAc)_2$ but an abundant ppt. with basic Pb acetate. $BaCl_2$ gives a ppt. sol. in dil. HCl. Nitron forms a difficultly sol. salt. On dry heating, III carbonizes to an exceedingly voluminous mass. Concn. of the mother liquors of III gives, in varying yields, a *salt B* (IV) of the same compn. but more sol. and *d*-rotatory; $(\alpha)_D$ 1° to 7°. III seems to be homogeneous but IV is probably a different salt contaminated with varying quantities of III. Its Cu no. is 8–9. In view of its method of formation at room temp. in a "dry" way, II is believed to be an ester derived from I in the same way as the known I esters of other inorg. and org. acids, a view supported by the properties of II and III (slight reducing power, amorphous character, slight rotatory power, colloidal aq. soln. Cond. detns. on III gave values ranging from 41.6 for V 32 to 80.2 for V 2048, the increase in dissocn. in soln. being accompanied by an increase in disaggregation. Attempts to regenerate I from II have thus far failed. Alkalies attack the II only slightly and although acids split off the H_2SO_4 quant., they do so only on heating and very gradually and the C residues undergo deep-seated decompn. at the same time. In the analysis of III it was noted that prepns. which, from their compn., must have contained K_2SO_4 did not give the usual test for SO_4 ions on treatment in acid with $BaCl_2$, and expt. showed that the pptn. of $BaSO_4$ from HCl solns. of sulfates by $BaCl_2$ can within certain limits be prevented by the previous addn. of II (*e. g.*, a mixt. of 10 cc. 0.04 *N* H_2SO_4, 0.1 g. III, 1 cc. of 12% HCl and 8 cc. 0.1 *N* $BaCl_2$ gave a slight turbidity only after 36 hrs.). III similarly prevents the pptn., within certain limits, of numerous other difficultly sol. compds. (PbI_2, $AgCrO_4$, $HgCrO_4$). If the quantity of III added to certain solns. well-crystd., not very difficultly sol. substances is such that crystn. is not wholly prevented but only retarded, the habit of the crystals is often (*e. g.*, with tartaric acid or $KClO_4$) changed. If samples of filter paper which have been treated with an excess of SO_3 are not worked up at once but are allowed to stand (protected from moisture) they become, in the course of 1 or more days, transparent and finally change to a homogeneous, brown, transparent, viscous mass which with aq. KOH yields products very easily with approx the compn. $C_6H_6O_5(SO_3K)_4$. A salt of such a compn. is without doubt no longer a deriv. of I; in its formation a new HO group doubtless has been formed by opening of a ring in the mol. of the anhydrosugar and at the same time the assocn. between the original mols. of the I has been, if not completely destroyed, at least greatly diminished. The new salt has a Cu no. of about 30. In the prepn. of the above substances, it is not necessary to start with pure cellulose; they can be obtained from wood shavings. C. A. R.

Benzylcellulose and its applications. L. Clément and C. Rivière. *Chimie et industrie* **Special No.**, 670–2(April, 1928).—See *C. A.* **22**, 3293. A. P.-C.

The action of strong sodium hydroxide solutions on cellulose. P. Waentig. *Papierfabr.* **25**, Fest- und Ausland Heft 112–5(1927).—Cellulose in strong NaOH solns. (17.5%) changes very little even after an immersion of 30 days; on the other hand, cellulose which is immersed in strong alkali soln. and then allowed to "age" dissolves more readily in alkali. Its soly. increases up to 30 days when an equil. is apparently reached. At the end of a 30 days' immersion of sulfite pulp its α-cellulose content was 78.6%; after a similar time of aging the α-cellulose content of the same pulp was reduced to 57.2%. The immersion figure for cotton was 97.7%, while its aging figure amounted to 79.2% for the same length of time. The β-cellulose content of these materials is correspondingly increased whenever there is a decrease in the α-cellulose, so that the sum of the two remains practically const. A microscopical study of these two effects produced by alkali indicates that the fiber is not morphologically homogeneous. Aging causes its breakdown to fibrillae. The assumption is made that O of the air plays a role in the aging phenomenon. J. L. Parsons

The action of concentrated nitric acid on cellulose (as determined by x-ray methods). K. R. Andress. *Z. physik. Chem.* **136**, 279–88(1928).—The action of HNO_3 of about 1.42 sp. gr. on cellulose gives addn. compds., $2C_6H_{10}O_5.HNO_3$ (I) and $2C_6H_{10}O_5.2HNO_3$ (II). The latter was prepd. by Knecht (*Ber.* **37**, 551(1904)) and has been shown by Katz and Hess (*C. A.* **21**, 1358) to give hydrocellulose on regeneration with H_2O. It is shown by A. that both compds. give the same x-ray diagram, a monoclinic system of the dimensions; a = 12.20 A. U.; b = 10.28 A. U.; c = 9.73 A. U.; β = 53° 7'. Hence I is an addn. compd., II an adsorption complex of I and HNO_3. Cellulose itself gives: a = 8.35 A. U.; b = 10.28 A. U.; c = 7.96 A. U.; β = 78°. The addn. of HNO_3 is accompanied by enlargement of the lattice in one direction only, the 0 0 2 and 1 0 1 planes being unaffected. R. H. Doughty

Graphical evaluation of nitrating acids. Artur Benda. *Chem. Obzor* **2**, 129–32; *Chem. Zentr.* **1927**, II, 1776.—A graphical method which is described has been tested in the operation of a *cellulose factory*. It is applicable to other processes. C. C. D.

Modern solvents and softening agents for nitrocellulose, celluloid and acetylcellulose. A. Noll. *Papierfabr.* **25**, Tech.-Wiss. Teil 65–73(1927); cf. *C. A.* **22**, 867.—An address in which the newer nitrocellulose solvents and plasticizers are described. Cyclohexanol acetate is preferable to amyl acetate as a solvent. Me hexalin acetate, a mixt. of 3 isomeric hexahydrocresols, is similar to cyclohexanol acetate in solvent power. J. L. Parsons

Oxidation of alkali-cellulose with gaseous oxygen. II. Wilhelm Weltzien and Gerhard zum Tobel. *Ber.* **60B**, 2024–32(1927); cf. *C. A.* **20**, 3806.—Evidence is cited that the reaction of alkali-cellulose with O_2 (air) may be of little significance. Cotton and hydrated cellulose (cuprammonium silk) were allowed to swell in NaOH solns. of concns 10–50% by vol. The excess of NaOH was pressed out and the mass exposed to O_2, the absorption being detd. at intervals. With increasing NaOH concn. the O_2 absorption increased and was slightly greater in the cuprammonium silk. This absorption increased up to 30% NaOH concn. and reached an equil. in 15 days. Alkali consumption amounted to more than $^2/_3$ of the O_2 absorbed [$C_6H_{10}O_5 + 6\ O_2 + 12\ NaOH = 6\ Na_2CO_3 + 11\ H_2O$]. Decreased reactivity at higher NaOH concns. is suggested as due to further compd. formation between the cellulose and the NaOH. With the same concn. of NaOH soln. the degree of O_2 absorption varied with the hydration and amt. of NaOH retained by the fibers after compression. The products of the oxidation are yellow to brown in color and gelatinous in nature, generally sol. in NaOH When the yellow colored solns. were acidified large amts. of CO_2 were evolved and the alkali-sol. cellulose was pptd. as a white, voluminous mass, which was difficult to filter and possessed a Cu no. 1.93. The major portion of the oxidation products are sol. The ratio between the alkali consumption and the O_2 absorption in 2 expts. with 30% NaOH soln. was const. Simple oxidation products are formed comparatively rapidly. Even with the max. amt. of O_2 absorbed very little chemically changed cellulose is left. The reaction of alkali-cellulose in an atm. of N_2 is different. Indications are that one portion of the cellulose is far more reactive than another. J. L. Parsons

Hemicelluloses. Emil Heuser. *Papierfabr.* **25**, Tech.-Wiss. Teil 238–43(1927).—The chemistry of hemicelluloses is reviewed in an address. Methods for the detn. of hemicelluloses are purely conventional and the results lack uniformity. β-Cellulose from sulfite pulp consists of 78.16% cellulose, 13.68% xylan and 5.64% mannan. Depolymerized cellulose appears as the chief constituent and the pentosan content is greater than the hexosan content. In γ-cellulose these same constituents are present. Alk. exts. of sulfite pulp yield Cu-alkali compds. similar to cellulose. Such compds., as for instance the xylan Cu-alkali compd., of the compn. $(C_5H_8O_4)_2.Cu(OH)_2.(NaOH)_2$, are bright blue in color, are sol. in NH_4OH, decompose on drying, giving a green coloration, and tend to depolymerize the polysaccharide. The $Cu(OH)_2$ is assumed to decompose, forming Cu_2O and O which oxidizes the cellulose or hemicellulose complex. The formation of such compds. indicates a similarity between cellulose and the hemicelluloses, which vary greatly depending upon the nature of the cellulosic material. J. L. Parsons

Viscosity determination on wood cellulose. L. Rys. *Chem. Obzor* **1**, 83–6; *Chem. Zentr.* **1927**, II, 1419.—Dissolve 3 g. cellulose in 100 cc. ammoniacal standard Cu soln. in an atm. of indifferent gas. Det. the viscosity of the clear soln. by measuring the time of fall of a glass or steel ball (diameter 3.3 mm.) through a column 15 cm. high at a definite temp. Detailed directions are given. The accuracy is ±15%. J. S. Reichert

Carbohydrate constituents of the easily hydrolyzable hemicellulose of pine. Erik Hägglund, F. W. Klingstedt, Truls Rosenqvist and Helmut Urban. Inst. for

Wood Chem., Åbo, Finland. *Z. physiol. Chem.* 177, 248-63(1928).—The hemicellulose of pine wood consists of an easily and a difficultly hydrolyzable portion. If the wood is hydrolyzed by heating under pressure with mineral acid a sugar results which comes partially from the cellulose. Only by diminishing the H-ion concn. by buffering, as is the case with sulfite acid ($NaHSO_3$ in H_2SO_3) can the hemicellulose alone be brought into soln., and then only its easily hydrolyzable portion. Analysis of the sugar thus obtained in the sulfite liquor takes for granted that the lignosulfonic acid has been successfully removed. By pptn. with α-$C_{10}H_7NH_2$ it is not possible to effect a quant. sepn. Subsequent treatment of the sugar soln. with EtOH and charcoal yields a soln. which contains nearly all the sugar in a pure state. Pptn. of lignosulfonic acid entails a considerable decrease in reducing power which indicates a certain reducing power on the part of lignosulfonic acid. In order to det. whether glucose is present in the sugar of sulfite liquor, the mannose must first be pptd. as the hydrazone. After liberation of the residual sugar with BzH, glucose was satisfactorily demonstrated. Glucuronic acid was not present in this sugar fraction. The presence of glucan in the easily hydrolyzable hemicellulose of pine is thus shown. Mannose, galactose and fructose were also demonstrated. On the basis of rotation of the fermented sugar soln. arabinose as well as xylose may be present. Galacturonic acid was found in the EtOH-insol. fraction. If this acid is derived from a hitherto unknown wood pectin, the amt. of such pectin, assuming it to be similar to beet pectin, is estd. at 0.7% of the wood substance. The compn. of the easily hydrolyzable pine hemicellulose, which comprises 18% of the wood, is, after hydrolysis, 1[illegible] pentoses, 42.7% mannose, 4.2% galactose, 3.2% galacturonic acid, 4.0% fructose and 28.9% glucose. A. W. Dox

The preparation of cellulose from agricultural by-products. Umberto Pomilio. *Pulp Paper Mag. Can.* 26, 1293-6, 1324(1928); cf. *C. A.* 22, 1038.—An address discussing the advantages and possibilities of the Cl gas process for the production of pulp from cereal straws and similar agricultural waste products. A. P.-C.

The chemistry of lignin. Georges Dupont. Institut du Pin, Bordeaux. *Pulp Paper Mag. Can.* 26, 1183-8, 1235-7, 1254-8, 1267-8, 1297-1300, 1326(1928).—See *C. A.* 22, 3291. A. Papineau-Couture

Spirit for combating celluloid fires. K. Hauck. *Zentr Gewerbehyg. Unfallverhüt.* 14, 293; *Chem. Zentr.* 1927, II, 2467.—In case that a wet, raw celluloid mat catches fire on the cylinders, the fire loses its explosive character if alc. is poured on the material at the beginning of the fire. Quiet flames develop which can be easily smothered with covers of asbestos. G. Schwoch

The ripening of viscose. J. Frenkel. *Cellulosechemie* 9, 25-6(1928).—A new theory for the ripening of viscose is presented which, in contrast to the usual view, does not admit a polymerization of the cellulose to the xanthogenate during ripening. F. considers viscose as a system of 2 colloids, the xanthogenate and the cellulose; for on sulfidizing alkali-cellulose, dicellulose xanthogenate is formed first, which on continued ripening is hydrolyzed and decompd. into its constituents CS_2, NaOH and cellulose. Proof of this hypothesis was given by the following expt.: A mixt. of 3 l. viscose and 750 g. pressed, regenerated cellulose, obtained from 1 l. of the same viscose by pptn. with N H_2SO_4, was dispersed in Plausons colloid mill for a short time with NaOH. Before the expt. the viscose had a degree of ripening C_z = 2.8, 7.8% cellulose and 7.09% NaOH; after the expt. C_z = 3.9 with a cellulose content of 7.55% and NaOH 7.09%. In this manner a ripe viscose was obtained from an unripe viscose with a considerable saving of time. L. C. Fleck

Change of plasticity of viscose with ripening. K. Atsuki, T. Takagi and T. Ohta. *Cellulose Ind. Tokyo* 3, 317-20(1927).—Measurements of the rate of flow of a viscose contg. 7% of cellulose and 7.78% of NaOH, carried out in a modified Ostwald viscometer at 25° under pressures of from 3 to 25 cm. of Hg, after ripening the material at 25° for various times from 53 to 240 hrs., show that viscose has a slight but measurable plasticity, since the flow rate-pressure curve at a lower pressure is convex to the pressure axis, giving a yield value. As ripening proceeds, the yield value becomes smaller, reaches a min. at 121 hrs., and again increases. It is supposed that the disperse phase, at first a continuous system, becomes less continuous by dehydration with the ripening, but that after max. dehydration, when the yield value is a min., it begins to coagulate, forming a firm continuous system giving a yield value. The disperse phase, before and after min. plasticity is reached, is more or less continuous, but differs in rigidity. In the former case it is easily deformable through being highly hydrated, while in the latter it is rigid on account of the formation of micelles of highly hydrated particles. B. C. A.

The recovery of volatile solvents in the manufacture of artificial textiles. J. H.

BRÉGEAT. *Chimie et industrie*, Special No., 687–96(April, 1928).—A discussion of the necessity of the recovery of volatile solvents in the manuf. of artificial textiles from the economic and sanitary standpoints. It is shown that absorption by such materials as activated charcoal and SiO_2 gel is uneconomical as well as dangerous on account of fire hazard. As regards absorption by scrubbing with a liquid that exerts merely a solvent action or that reacts chemically with the vapors, absorption of alc.-Et_2O by H_2SO_4 or of alc.-Me_2CO by $NaHSO_3$ or absorption of either mixt. by H_2O is shown to give a very low yield, while recovery by absorption in cresol gives a high yield in both cases. A. PAPINEAU-COUTURE

Determination and significance of the alkali soluble constituents in artificial silks. W. WELTZIEN. Textilforschungsanstalt Krefeld. *Papier-Fabr.* **25**, Fest- und Ausland Heft 66–71(1927).—Max. soly. of artificial silks and chem. wood pulp exists at a concn. of 10% NaOH; even with a 9% alkali soln. the differentiation between these substances is more pronounced. Cuprammonium silk is the most resistant to alkali, being sol. to the extent of about 30%; viscose is sol. 40–50% and nitrosilk is practically completely sol. in 10% NaOH. J. L. PARSONS

The preparation of artificial silk. A. MÜLLER. *Z. ges. Textilind.* **30**, 450; *Chem. Zentr.* **1927**, II, 1419.—Potato flour, decomposed with Diagum from the Diamalt-A. G., Munich, produces a flexible, strong fiber. Avimalt from the same firm is recommended for softening artificial silk. J. S. REICHERT

Artificial silk, the various processes of manufacture, and its properties. D. G. ZWARTZ. *Indian Textile J.* **37**, 266–7, 302–3; *Chem. Zentr.* **1927**, II, 1419.—A brief description of nitro, Cu, viscose and acetate silk. J. S. REICHERT

Acetate silk. R. O. HERZOG. *Papier-Fabr.* **25**, Tech.-Wiss. Teil 17–8(1927).—An address covering the chemistry of acetate silk manuf. The secondary acetate is made from the primary by mineral acids of medium concn., strong org. acids, or other compds. The primary acetate is a triacetate, possesses a particle size similar to the original cellulose, and is sol. in $CHCl_3$ and other halogen-contg. compds. The secondary acetate shows an Ac content between that of the tri- and diacetates. Its particle size is 0.5–0.2 that of the original cellulose and in the larger size it is sol. in Me_2CO and MeEtCO. The smaller size is sol. in esters. This acetate dissolves in non-solvents (C_6H_6, EtOH) after the addn. of solvents, the difference in soly. depending chiefly on the no. of free OH groups as well as on the particle size. J. L. PARSONS

Nitro and acetate silk. I and II. FRANZ REINTHALER. *Seide* **32**, 226–8, 258–60; *Chem. Zentr.* **1927**, II, 2525.—Data on the properties of cotton cellulose, the prepn. and properties of collodion wool, the prepn. of cellulose acetate, the properties of secondary cellulose acetate, and the prepn. of the spinning soln. from collodion wool and from cellulose acetate. C. C. DAVIS

Technic and economics of the American rayon industry. H. JENTGEN. *Papier-Fabr.* **25**, Tech.-Wiss. Teil 97–102(1927).—An address covering recent developments in the American rayon industry. American sulfite pulp is superior to European pulp for viscose manuf. Pulp contg. a very high α-cellulose content is generally undesirable if the value is over 90%; the viscosity may be less than with a pulp contg. a higher hemicellulose content. Such a low viscosity cannot be effectively corrected by shortening the ripening time or by reducing the temp. A sulfite pulp of a definite hemicellulose content is apparently necessary, in contrast to cotton. Pulps freed from such impurities do not yield superior threads. Viscose rayon is not pure α-cellulose but contains relatively large amts. of hemicelluloses, NaOH and CS_2. A portion of the hemicellulose content appears highly dispersed in the alk. soln. and becomes a sludge in the pptg. bath. A pulp which had been purified by 5 mercerization treatments did not yield a superior thread compared to an untreated pulp and the viscosity of the former viscose soln. dropped to 6–8, whereas the latter was 18. J. L. PARSONS

Testing sulfite liquor. ERWIN SCHMIDT. Mannheim-Waldhof. *Zellstoff u. Papier* **7**, 56–7(1927).—The iodate method for detg. free SO_2 is practically just as sensitive toward weak acids as the NaOH titration in the presence of phenolphthalein. With cooking liquors contg. org. acids greater precision cannot be obtained with the iodate method than with Höhn's method. Expts. with the iodate-iodide method in which the amt. of water was the only variable showed that by increasing the vol. of the latter the amt. of thiosulfate required for the titration decreased. J. L. P.

The dehydration of sulfite spirit with quicklime. E. SCHLUMBERGER. *Papier-Fabr.* **25**, Tech.-Wiss. Teil, 180–3(1927).—Com. sulfite spirit should not have a water content greater than 0.7% when mixed with C_6H_6 as a motor fuel. Data from 58 expts. relating to the dehydration of com. sulfite spirit under atm. pressure, in an autoclave under pressure, and in the vapor phase by means of CaO, are tabulated. Increasing

the temp. 10° doubles or triples the speed of dehydration. The size of the lime particles has little influence on the reaction. For best results 125% of the theoretical amt. of CaO required should be used. Using this CaO twice gives an EtOH yield in excess of 95%. About 10% of CaO is converted to $Ca(OH)_2$. The estd. time for dehydration to 0.5% water content when EtOH vapor is passed over CaO at 100° is 15 sec. contact. Non-aq. impurities, aldehydes, etc., are not removed during the dehydration process. J. L. PARSONS

Recent experiences in the evaluation of the waste sulfite liquors. I and II. G. TESCHNER. *Kl. Mitt. Ver. Wasserversorg. Abwässerbeseitig.* **3,** 17–21, 157–62; *Chem. Zentr.* **1927,** II, 1878.—A discussion of the most important and promising procedures for utilizing the waste liquors, particularly for the production of *sugar, tanning agents, pitch, disinfectants, coal dust* briquets, fuel from the concd. liquors and various other valuable products in addition to sulfite charcoal. J. S. REICHERT

The utilization of waste sulfite liquor for fertilizer purposes. J. GÖRBING. Forschungsanstalt für Bodenkunde und Pflanzenernährung, Rellingen in Holstein. *Papier-Fabr.* **25,** Tech.-Wiss. Teil, 573–5, 633–8, 653–8, 671–3(1927).—Bokorny [*Mitt. deut. Landwirtschaftgesellschaft* **1919**, 6 et seq., No. **16,** 202 et seq.(1920); cf. *C. A.* **13,** 1531] has published results which are very favorable to the use of waste sulfite liquor as a fertilizer. These results are not confirmed by G. in a series of extensive tests with waste sulfite liquor used in various ways as a fertilizer and with different plants. In many instances negative results were obtained or no improvement in plant growth was observed. There are 9 illustrations of growing plants. J. L. PARSONS

Contribution to the history of sulfate pulp manufacture. L. J. DORENFELDT. *Papier-Fabr.* Fest- und Auslands-Heft **1928,** 97–107; *Paper Ind.* **10,** 809–13(1928).—Directions for the process as outlined by the inventor, C. F. Dahl, in 1884, are given, with cooking curves and a sketch of the digester used. R. H. DOUGHTY

Pulp mill waste recovery methods. J. B. C. KERSHAW. *Paper Trade J.* **87,** No. 6, 61–2(1928); cf. *C. A.* **22,** 1040.—A review. A. PAPINEAU-COUTURE

Photomicrographing ground pulp. E. OMAN AND B. SEGRING. *Svensk Pappers-Tid.* **31,** 438–41(1928).—Photomicrographs of fibers colored with the following dyes are shown: rhodamine R extra, fuchsin and HCl, safranine, chloramine black and alum, and carbon black G under 4 different conditions. Dye solns. were of 1% strength and the dyeing was done directly on the prepn. glass. W. SEGERBLOM

Recent bleaching processes for pulp. J. FUNCKE. *Papier-Fabr.* **25,** Tech.-Wiss. Teil, 221–8(1927).—A review of American patents covering processes for bleaching pulp fibers during the last 10 years. J. L. PARSONS

Bleaching sulfite pulp. RAGNAR BERGQVIST. *Svensk Pappers-Tid.* **31,** 361–3, 397–9, 434–8(1928); cf. *C. A.* **22,** 1679.—The chemistry of the bleaching process is explained on the basis of exptl. and theoretical considerations, especially the effect of variations in the H-ion concn. of the bleaching liquor. Free Cl does not bleach sulfite pulp. The hypochlorite ion gives the best bleaching effect. *A new method for detg.* p_H is based on Wulff's Folien-Colorimeter and gives p_H values from 2.6 to 9.0 within ±0.1 error. The measurement can be made in turbid or strongly colored solns. A membrane is used, permeable to aq. solns. and contg. an indicator color which diffuses much more slowly than the H or OH ion and which changes color in proportion to the p_H value. A comparison scale shows the colors for each 0.2 p_H from 2.6 to 9.0. Artificial light may be used. A 3 cm. testing strip is stirred for 1–2 min. in the soln. to be tested and then compared with the standard. If the soln. is turbid, strongly colored or contains colloidal substances, the testing strip may be quickly rinsed with distd. water or pressed between filter paper. The detn. of p_H requires skill, particularly if much active Cl or free acid is present. The conditions for bleaching control samples are described in detail, 2 tables of numerical data and 2 graphs showing the results of 14 detns. The theoretical discussion of the above results starts with equations showing oxidizing and chlorinizing action of CaClOCl, the oxidizing action increasing with the alk. character, and the chlorinizing action increasing with the acid character of the soln.; it continues with a study of the dissocn. reaction and consts. involved, and concludes with a table giving the relation between the concns. of free Cl and of HClO, and that between HClO and the hypochlorite ion calcd. from 8 samples in a 0.1106 *N* CaClOCl soln. Similar measurements are made for a 0.034 *N* CaClOCl soln. The relations between the concns. of free Cl and of HClO, as well as that between HClO and the hypochlorite ion, are detd. for 8 samples at the Cl diminishing coeff. 31%. These relations are discussed. B. concludes that the hypochlorite ion plays the important part in industrial bleaching, that free Cl is injurious and that HClO has very little bleaching power. Controls for all above detns. were

obtained by 3 different methods, (1) the α-cellulose analysis, (2) the Cu no. and (3) the viscosity method. Unbleached cellulose gave α-cellulose 87.6%, β-cellulose 3.6%, ash 0.42%, Cu no. 2.08%, viscosity 32.0 and resin 1.17%. These values for each of 14 samples are tabulated and discussed. W. SEGERBLOM

Bleaching sulfite pulp at higher consistencies. ERNST HOCHBERGER. *Papier-Fabr.* **26,** Fest-und Auslands-Heft 66–88(1928).—The subject is considered from both the theoretical and practical standpoint, with especial reference to the relations existing in the first stage of 2-stage bleaching. Sixteen tables of data and 17 figures are presented. There is no advantage in going above 15–18% consistence, so far as time is concerned. Better results are obtained with pulps of average (10–16%) bleachability than with very hard or easy-bleaching pulps. With such average pulps it is best to bleach in 2 stages, the first at low temp. and high consistence, the second at low consistence and higher temp.; holding the second stage at high consistence, or bleaching in 3 stages, is poor practice. There is an optimum amt. (33–48% of the bleachability value on pulps bleaching at < 10 and > 20%, resp.) of bleaching agent for the first stage. Under the best conditions, 25–33% bleaching agent, and 33% time may be saved over the 1-stage low-consistence bleach. *Bleachability* here is defined as the amt. of bleach powder, contg. 33.3% active Cl_2, consumed in bleaching at 5% consistence and 37° in 2 stages. With fairly easy-bleaching pulps, in the first stage: a good const. (k) is obtained when the rate of bleach consumption is calcd. as a second order reaction; there is a linear decrease of p_H (detd. with indicators in the thrice dild. soln.) during the reaction, down to about 6.5 at the end; chlorination (formation of sol. Cl compds.) during bleaching is least at the otherwise most favorable conditions of consistence and bleach ratio (cf. also Rys, *C. A.* **22,** 2271). Pulps which show variations in k and p_H from a regular course also show higher chlorination. Hence, variations in the course of the reaction are due to the increase of side reactions with respect to the true bleaching reaction of oxidation. The bleaching process appears to be governed, especially in the later stages, by the diffusion rate of dissolved incrustants. A great part of the bleaching agent used in the first stage goes to decomp. the incrustants present, these compds. being rendered sol. and removed in the second stage. Finally, good washing is necessary; care should be taken here to avoid a sudden drop in p_H, which would lead to repptn. of dissolved incrustants on the fibers. R. H. DOUGHTY

A new method of determining the color of bleached pulp. G. PORRVIK. *Svensk Pappers-Tid.* **31,** 466–9(1928).—Chalks of standard color, easily reproduced, are prepd. by mixing pharmaceutical chalk with $K_2Cr_2O_7$ soln. and evapg. to dryness. The chalks are graded according to $K_2Cr_2O_7$ content. A small amt. of English Red may be added, the amt. depending upon the red tinge of the class of pulp to be tested. The lightest colored sulfite pulps range from 0.4 to 0.5, and dark pulps as high as 1.60 have been tested. Sulfate pulps test about 2.50. The test is made by smearing pieces of chalk the size of a pea on the pulp sample until the proper match in color is found. W. SEGERBLOM

A rotating disk machine for measuring pulp color. CHESTER G. LANDES. Mead Fibre Co. *Paper Trade J.* **87,** No. 13, 48–50(1928); *Paper Mill* **51,** No. 39, 10, 39–40, 50(1928).—The Ives colorimeter is unsuitable for routine work, and because of various mech. defects its results are open to question. Disk machines as at present on the market are unsuitable for routine testing of pulp for color, for a no. of reasons which are given. It was improved by making all the disks alike and pasting varying sections of colored paper on them, which furnished a definite and quant. method of changing the difference between wheels and enabled other properties to be controlled more easily. The method of prepg. the disks is described. The accuracy, permanency, ease of reproduction of results and standardization of the instrument were detd. by means of tests. The instrument furnishes satisfactory comparable results for routine work under given conditions, provided its use is confined to the correct field and within its limitations. The latter are described and suggestions are made as to lines of research on methods of improvement and elimination of defects in the instrument. A. PAPINEAU-COUTURE

The danger of explosion in the manufacture of bleach liquors from liquid chlorine. E. SCHÖNBERG. *Papier-Fabr.* **25,** Tech.-Wiss. Teil, 581(1927).—An explosion resulted in a cast Fe tower covered with asphalt in which a $Ca(OH)_2$ soln. was treated with Cl_2, countercurrent flow. The cause is attributed to the supercooling of the mixt. owing to insufficient warming of the Cl_2 before passing into the soln. The decompn. of $Ca(OCl)_2$ to chlorate and chloride is without danger; the reaction $Ca(OCl)_2 = CaCl_2 + O_2$ occurs in an explosive manner, especially in the presence of such catalyzers as P, As, S, Fe_2O_3, etc. J. L. PARSONS

The explosion risk in the use of liquid chlorine for bleach liquor. H. KIRMREUTHER AND L. PURRMANN. Königsberger Zellstoffabriken und chem. Werke Koholyt. *Papier-Fabr.* **25**, Tech.-Wiss. Teil 698(1927); cf. preceding abstract.—A reply to E. Schönberg, in which the supposed cause for an explosion was the formation of solid $Ca(OCl)_2$ and its decompn. to O_2 and $CaCl_2$, is refuted from a chemical and a thermal standpoint. One kg. chlorine gas sets free 290.7 cal. in bleach liquor manuf. This heat warms the soln. as the heat of vaporization at 8° for 1 kg. Cl_2 is only 62.7 cal. J. L. PARSONS

The determination of the chlorine consumption number of pulps. A. EHRENFRIED. *Papier-Fabr.* **25**, Tech.-Wiss. Teil, 130–1(1927).—To 5 g. dry pulp (21 g. wet) add distd. water and sufficient bleach soln. to give 6% available Cl calcd. on the pulp. After 1 hr. at 20°, filter and test 50 cc. in the following manner: Add 20 cc. 0.1 *N* As_2O_3 and 3–5 drops Me orange indicator. Acidify with 10–15 cc. concd. HCl and titrate with 0.1 *N* $KBrO_3$ (2.7837 g. per l.) until the red color disappears. The comparative relation between the cc. of 0.1 *N* $KBrO_3$ and the Cl consumption no. is tabulated. J. L. P.

The determination of the copper number. CARL G. SCHWALBE. *Papier-Fabr.* **25**, Tech.-Wiss. Teil 157–60(1927).—S.'s Cu no. detn. and its numerous modifications are discussed. The alkali boil test of Cross and Bevan and the boil-off no. of Kaufmann for detg. cellulosic degradation products are also included. Seventeen references are listed. J. L. PARSONS

The influence of the fineness of pulp upon the copper number. K. G. JONAS. Techn. Hochschule, Darmstadt. *Z. angew. Chem.* **41**, 960–1(1928).—With the Schwalbe-Hägglund and Schwalbe-Braidy methods, it has been shown that pulp cut in 6 mm. squares gives results 20–50% higher than rasped pulp (cf. Gray and Staud, *C. A.* **21**, 2795). The best method of disintegration is to soak the pulp until soft, then shake vigorously with a few glass beads. This separates the fibers into a uniform suspension with a min. of mech. action. Prolonged shaking produces slime and gives variable results; 2 min. should be sufficient for complete disintegration. R. H. D.

The chemical properties and merits of summer and spring wood as raw material for the manufacture of sulfite pulp. E. HAGGLUND AND T. JOHNSON. *Pappers och Trävaru Tids. Finland* No. 20, 594(1926); *Papier-Fabr.* 25, Tech.-Wiss. Teil 22–3(1927).—From digestion expts. carried out with 30 g. wood and 150 cc. cooking acid in glass tubes, spring wood and summer wood were found to cook at about the same rates. Throughout the 3 series of tests the spring wood yielded liquors contg. less amts. of sugars than the liquors from summer wood, but the difference was small. The latter produced more AcOH and HCOOH. The pentosan, lignin and ash contents of the resulting pulps were similar. The stretch and tearing length were slightly inferior with pulps made from spring wood, while the fibers from summer wood appeared to be more brittle according to the folding test. J. L. PARSONS

Production of sulfite pulp. I. Cooking. L. RYS. *Chem. Obzor* **1**, 330–8(1926); *Chem. Zentr.* **1927**, II, 992.—Citing the modern literature, which is compiled as an index, R. gives a comprehensive survey of the methods used for cooking sulfite pulp. He discusses the chem. foundations of the cooking, and the compn. of the raw materials, as wood and sulfite liquor. Then he describes the hydrolysis and digestion of lignin, the influence of the p_H with regard to the constitution of lignin, the reaction and waste products formed, the possibility of controlling the reaction during the cooking and the use of the results gained from the cooking tests. G. SCHWOCH

Production of sulfite pulp. II. Bleaching. LAD. RYS. *Chem. Obzor* **1**, 364–8 (1926); *Chem. Zentr.* **1927**, II, 992; cf. *C. A.* **22**, 2271.—The bleaching of the sulfite pulp is briefly described and the possibilities of a further development are discussed. Citing the resp. literature, R. then mentions the chem. theories and the method of examn. of the chem. and mech. control, with reference to the newest processes. G. S.

Instrument control for sulfite pulp mills. REGINALD TRAUTSCHOLD. *Paper Trade J.* **87**, No. 2, 44–8(1928).—A discussion of the necessity and advantages of automatic indicating and recording instruments for controlling and regulating the operation of S burners, gas coolers, acid towers, digesters and pulp-prepg. equipment. A. PAPINEAU-COUTURE

Instrument control for soda and sulfate pulp mills. REGINALD TRAUTSCHOLD. *Paper Trade J.* **87**, No. 8, 38–42(1928).—A cursory review of the steps entailed in soda pulp production and their effective coördination into one continuous and repetitive process, pointing out the strategic utilization of instrument control. A. P. C.

Sulfate process patent review. JOSEPH ROSSMAN. *Paper Trade J.* **87**, No. 6, 57–9(1928).—A review of U. S. pats. A. PAPINEAU-COUTURE

The Wagner furnace (for black liquor recovery). C. L. WAGNER. *Paper Mill* **51**, No. 26, 16, 39(1928).—A description of the furnace and its operation. A. P.-C.

A mill scale demonstration of temperature control in sulfite pulping. G. H. CHIDESTER. Forest Products Lab., Madison, Wis. *Paper Trade J.* **87**, No. 15, 64–6 (1928).—The importance and advantage of following definite temp. schedules in cooking sulfite pulp to obtain optimum yield and quality have been shown by the lab. expts. of Miller, *et al.* The results obtained were applied to the production of sulfite from spruce and hemlock in an 80-ton mill. It was found that by following a definite predetd. temp. schedule the amt. of screenings was reduced by about 50%, the time required to run the stock out of the blow pits was increased by about 15–30 min., the yield was increased about 5% without addnl. cost of raw material or labor, the strength of the pulp was increased, the bleach requirements were reduced and both the strength and bleach requirements were made more uniform. The results were obtained with an increase of only 1 hr. in cooking time (from 8.5 to 9.5 hrs.). A. PAPINEAU-COUTURE

Mechanization of pulp cooking. LEO FRIEDLÄNDER. *Papier-Fabr.* **26**, 474–5 (1928).—An automatic *relief-valve for sulfite digesters* is described. R. H. DOUGHTY

Effect of temperature on sulfite cooking. ERIK HÄGGLUND. *Pappers och Trävaru-Tids. Finland* No. **12** (1928); *Papier* **31**, 717–25(1928).—Other cooking conditions being equal, a yield of 55% of pulp contg. 7–8% lignin can be obtained with max. cooking temps. of 120–35°. When the max. cooking temp. is carried to 135°, delignification occurs so rapidly that it is difficult to stop the cook at exactly the proper moment, while this can easily be done with max. temp. of 120°, which constitutes the advantage of low-temp. cooking. In the stages where the pulp has a Br no. of 0.15–0.30 (yields of 52–48%), it makes no difference whether the max. temp. is 120° or 135°, the pulp yields and their Br nos. being the same and the pulps having practically the same strength when beaten to the same degree in both cases. With rapid cooking (max. temp. 145°), however, conditions are different, the pulp being of lower quality and the yield for the same degree delignification about 3% lower. The rate of delignification is approx. doubled by increasing the cooking temp. 10°. Temp. was found to have relatively little influence on the acidity, sugar content of the liquor and production of H_2SO_4. A. PAPINEAU-COUTURE

The sulfur dioxide, heat and volume balance in relief liquor and gas in sulfite pulping. G. SOLTAU. *Papier-Fabr.* **26**, 550–4(1928).—The relations are analyzed to show the SO_2 recovery and associated heat losses in various stages of a representative direct-steam cook. About 1% of the total heat used in cooking is lost with the relief gas, 10–12% with the relief liquor. This may advantageously be used in preheating the cooking acid. Nomographs show the relation of relief gas compn. to digester temp. and pressure, also the interrelation of strength and volume of tower and cooking acid, S consumption and SO_2 recovery. R. H. DOUGHTY

Swelling-power measurement on unbleached sulfite pulp. W. NIPPE. Koholyt A.-G., Sackheim. *Papier-Fabr.* **26**, 501–6(1928).—The degree of swelling of a pulp is distinct from its swelling power. The latter property has been studied as a possible means of technical evaluation. Samples of 1–2 g. were dried at room temp. over P_2O_5 *in vacuo*, then exposed to a current of air at 80% relative humidity and 30° until const. wt. was reached. The amt. of H_2O taken up by 100 g. pulp under these conditions is termed the *swelling no.* The equil. requires 2–3 days for establishment; there is an hysteresis effect in approaching equil. from dry and wet pulps. Repeated drying at room temp. does not affect the values, nor does storage for 9 months. The values are readily reproducible with an absolute error of 0.075%. Values range from 10.5 to 13.6 for ordinary pulps, 6.77 for Guignet (hydro) cellulose. Oxycellulose gives a slightly decreased value. Swelling no. of pulp parallels Cl consumption (Sieber) and also depends on the type of cook (direct or indirect). Drying at high temp. may cause a large variation. Swelling is probably due to hemicelluloses present. The results are directly opposite to those of the D'Ans and Jager method (*C. A.* **20**, 819) using 15% NaOH, and in poor agreement with the Schwalbe strip method using H_2O (*C. A.* **19**, 174, 3017). The former is due to chem. effect, the latter to adhesion of H_2O. Use of swelling no. and Cl absorption value together gives an improved measure of pulp quality. R. H. DOUGHTY

The acid resistance of bronzes in sulfite pulp mills. HERBERT RAUCHBERG. *Papier-Fabr.* **25**, Tech.-Wiss. Teil 473–7(1927).—Thirty-nine metals were suspended 2–3 weeks in a sulfite pulp digester contg. a soln. in which 4.65% free SO_2 was present at the beginning of the cook. Cu lost 7.6% in wt.; Pb, 0.72%; Sn, 0.05%; while the Zn was completely dissolved. Sb was not attacked. The addn. of Zn to a bronze greatly reduces its acid resistance, and Sn and Pb raise its resistance. Addn. of 1.5% Sb increases the resistance of bronzes markedly. Sb and Pb behave in bronzes as if they were alloyed. The following limiting values are recommended for a good acid-

resisting bronze: Pb, 15–19%; Sn, 5–10%; Sb, according to the desired hardness 1–5%; and Cu, 66–75%. An Al bronze contg. 92% Al and 8% Cu was very strongly attacked by H_2SO_3. J. L. PARSONS

Effect of cooking time on pulp constants. I. CHINCHIN. *Zellstoff u. Papier* **7,** 235 (1927).—With the increase in the cooking time the lignin content (Willstätter and Krull method) of the chips decreases, the Cu no. (Schandroch and Häen-Low) increases, and the baryta resistance, the Cl factor (Tingle), and the amt. of Cl_2 (Sieber) required for bleaching are reduced. Decrease in total SO_2 of the cooking liquor resulted in an increase in the pentosan value for the pulp. The α-cellulose content was not affected by the cooking time but was affected by the strength of the acid. The resins remain practically the same but the ash decreased with the time. J. L. PARSONS

Electrical moisture measurements on sulfite pulps. E. SCHLUMBERGER. *Papier-Fabr.* **25,** Tech.-Wiss. Teil 81–3(1927).—The pulp sample is placed between metallic plates, which act as electrodes, under a definite pressure. The elec. resistance is measured and plotted against the water content of the pulp. No difference was observed when the sample was moistened with cond. water and with distd. water. The method offers a rapid means for detg. the moisture in pulps and may even be capable of development to a continuous recording device for control work. J. L. PARSONS

Alkali-soluble components of sulfite pulp and artificial silk. W. WELTZIEN. Textilforschungsanstalt Krefeld. *Papier-Fabr.* Fest- und Auslands-Heft, 115–20 (1928); cf. *C. A.* **21,** 2383.—The procedure used was to soak 0.5 g. of pulp in 30 cc. of NaOH soln. for 3 hrs., filter, wash 3 times with NaOH, treat with HCl, wash, dry and weigh. Increase of time up to 30 hrs. generally showed no significant increase of sol. material. The max. soly. of pulps is in NaOH of about 10% concn. As the time of treatment is increased, the max. approaches 10% concn. more closely. The decrease in soly. in concns. above 10% may be due to mass action effects. Artificial silk prepd. in different ways shows a similar, much greater max. soly. Nitrate silk is entirely dissolved in 10% NaOH. The colloid system "artificial silk" is distinguished from the system "pulp" by a relatively lower soly. in dil. and concd. alkali and much greater soly. in 10% alkali. The exptl. curves are reproducible; it has even been possible to identify an unknown pulp sample in this way. It is suggested that cellulose esters could most readily be studied or characterized by detg. the alkali soly. of the cellulose regenerated from them. R. H. DOUGHTY

Some fundamental principles underlying the manufacture of sulfite pulp. HAROLD HIBBERT. McGill Univ., Montreal. *Pulp Paper Mag. Can.* **International No.,** 125–7 (Feb., 1928); *Paper Mill* **51,** No. 6, 18, 20, 26(1928).—An outline of the work done under H.'s direction at the Forest Products Labs. of Canada and the Dept. of Cellulose and Industrial Chemistry of McGill Univ., on problems connected with the fundamental principles of sulfite pulping. The work of Campbell on SO_2 solns. (*C. A.* **21,** 1578; **22,** 1680), of Birchard on the action of cooking liquor on a variety of pulps and cotton fabrics (*C. A.* **21,** 4064; **22,** 684), and of Scarth on the penetration of wood fibers by liquids (*C. A.* **22,** 1852) is briefly mentioned. Unchanged lignin (*i. e.*, lignin in the same form as it exists in wood) can be extd. by heating spruce wood meal at 100–10° with ethylene glycol, glycerol or glycerol chlorohydrin, contg. a trace of I or of dil. HCl; which constitutes a radically new departure in the isolation of unchanged lignin. The mild chem. character of this method of extn. is clearly indicated by the fact that the hemicelluloses, pentosans and hexosans extd. in the process are obtained in a non-hydrolyzed condition, not having been converted into pentoses and hexoses. Sulfonic acids of unsatd. aldehydes analogous in compn. to lignin were found to be almost as strong as HCl or H_2SO_4, and ligninsulfonic acids very probably belong to the same category. It has been found that both satd. and unsatd. aldehydes, when treated with H_2SO_3 and bisulfites, yield strong acids, *viz.*, sulfonic acids, contrary to the generally accepted belief that the former yield sulfite esters and the latter a mixed sulfite ester-sulfonic acid. This investigation of the reactions of aldehydes is leading to a much better appreciation of the cause of "burnt cooks," and also of the mechanism of bleaching. Work is also being carried out on the properties of ring structures related to cellulose and on the problem of polymerization (nature of aggregate and degradation of cellulose). A. PAPINEAU-COUTURE

The Stebbins acid accumulator system for sulfite mills. T. L. DUNBAR. *Paper Trade J.* **87,** No. 8, 47–8(1928).—A description of U. S. pat. 1,646,084 (*C. A.* **22,** 165). A. PAPINEAU-COUTURE

Heat recovery system for sulfite mills. A. F. RICHTER AND F. A. AUGSBURY. *Paper Trade J.* **87,** No. 8, 49–50(1928).—A description of U. S. pat. 1,653,416 (*C. A.* **22,** 869). A. PAPINEAU-COUTURE

Developments in the preparation of calcium and magnesium bisulfite liquors. D. W. Steuart. National Research Council of Canada. *Pulp Paper Mag. Can.* **26**, 1013–6(1928).—See *C. A.* **22**, 3525. A. Papineau-Couture

Kinetics of the cooking reaction: experiments on the rate of cooking of straw by the soda process. R. Michel-Jaffard and A. Nicollet. Papeteries Navarre. *Chimie et industrie* Special No., 599–612(April, 1928).—A detailed description is given of a lab. investigation of the mechanism of cooking straw with NaOH under conditions approximating those of the com. manuf. of soda pulp. From a discussion of the laws of mono-, bi- and trimol. reactions, it is shown that the proportion of alkali consumed at the end of a given time is independent of the vol. of liquor in contact with the straw, or is proportional to this vol. or to its sq. according as the reaction is mono-, bi- or trimol. Under conditions similar to those used in com. practice, the consumption of NaOH follows the law of bimol. reactions during the stage of max. cooking temp. Assuming that the alkali combined to form easily hydrolyzable compds. may be considered as combined alkali, the disincrusting reaction is not limited by the reverse reaction. The greater proportion of the combined NaOH is consumed during the charging and bringing up to pressure of the digester, being 12–3% of the moist wt. of the straw in the expts. described. It seems probable that the consumption of NaOH at this stage is governed mainly by diffusion and convection phenomena, and that the constituents giving strongly hydrolyzable compds. (especially SiO_2) are practically completely dissolved at this stage. Though the effects of temp. were not studied, it is considered likely they follow the exponential law of homogeneous reactions once the bimol. rate of reaction has set in, as this rate supposes that the chem. reactions proceed at such a low rate that the effects of diffusion become negligible. The application of these results to the control of com. soda cooks is discussed. A. Papineau-Couture

Automatic device for the recovery of condensed steam in pulp mills cooking by the indirect process. Sainte-Martine. *Chimie et industrie* Special No., 619–22 (April, 1928); cf. Escourrou, *C. A.* **21**, 1547.—App. at present in use to protect the boilers in case the condensate should be contaminated with liquor has been perfected by providing that the valves are operated by small servo-motors instead of electromagnets, that the contaminated condensate is directly discarded while the pure condensate is sent to the boilers, the discarded and utilized condensates are metered separately, and in case of accident to the mechanism the whole of the condensate is sent to waste. A. Papineau-Couture

Semi-chemical straw pulp as a substitute for chemical and mechanical wood pulps. Umberto Pomilio. *Chimie et industrie* Special No., 639–61(April, 1928).—After discussing the inevitable shortage of wood which is bound to come as a result of the ever-increasing consumption of paper (particularly of news print) and showing that cereal straws and similar materials can furnish a practically inexhaustible supply of raw materials if the technical and economic conditions of its conversion into news print can compete with woods suitable for paper making, P. describes at length expts. and tests which he carried out on the production of news print from semi-chem. straw pulp. The pulp was prepd. by a very mild cooking at atm. pressure with dil. NaOH or H_2O, followed by washing and a treatment with Cl gas insufficient to effect complete chlorination. Paper made from 60–70% semi-chem. straw and 40–30% groundwood is as strong as ordinary sulfite-groundwood news print; but is somewhat more difficult to handle on high-speed rotary presses, but this defect could doubtless be overcome. Under present conditions in Italy, the cost of manuf. of semi-chem. straw pulp is of approx. the same order as the cost of groundwood, and only about 60% that of news grade sulfite. A. Papineau-Couture

The semi-sulfite process. C. C. Heritage, C. E. Curran, W. H. Monsson and G. H. Chidester. Forest Products Lab., Madison, Wis. *Paper Mill* **51**, No. 40, 9, 12(1928).—The semi-sulfite process consists of a mild pulping action employing the usual constituents of sulfite cooking liquor, but so regulating the conditions of temp., time, concn. and ratio of acid to chips that the chips, although thoroughly impregnated, are only softened and thus retain their original form, at the end of the reaction, to a large extent. The softened chips are "blown" from the digester as usual, are thoroughly washed, preferably with warm water, and are then mechanically disintegrated to a true pulp by suitable equipment. For this purpose the rod mill has been found satisfactory, although other types of refining equipment can possibly be used as well. From the results of tests carried out with such pulp it is concluded that: (1) It appears to offer a means by which a high yield of pulp suitable for news print and other grades of coarse paper can certainly be obtained from spruce and hemlock, and possibly from hard woods and mixts., and perhaps from some of the more resinous

species such as jack pine. (2) The yields obtained can be varied at will from 25 to 50% in excess of present mill practice. (3) A considerable saving can be effected in the time required for cooking. (4) A max. bursting strength of a pt. per lb. per ream or more can be obtained from the pulp. (5) Screenings can be eliminated, since the total digester charge is utilized. (6) Approx. cost estimates indicate an ample margin of saving over the addnl. power and fixed charges incurred by rod milling. (7) Difficulty in discharging the digester by its own internal pressure would probably develop at yields above 60–5%. The recent trend in mill construction toward the employment of gravity discharge after complete release of pressure appears to meet such a difficulty.
A. PAPINEAU-COUTURE

The problem of lignin. FRITZ ROSENDAHL. *Metallbörse* **17**, 2273–4, 2329–30, 2386–7; *Chem. Zentr.* 1927, II, 2745.—Methods for the *isolation and the decompn. of lignin* are discussed, with a few *constitutional formulas.* C. C. DAVIS

The behavior of lignin and lignin chloride in the preparation of pulp by the chlorine process. P. WAENTIG. *Z. angew. Chem.* **41**, 493–8, 977–80, 1001–5(1928).—A study of the Cl process has been made to show how to decrease the chemical consumption, especially in pulping wood, and to sep. the lignin in a readily recoverable and valuable form. The exothermic heat of the reaction between Cl and lignified fibers is 120–150 cal. per g. though Wenzl (*Hauptversamm. Ver. Zell- und Papierchem. und Ing.* **1926**) gives much lower figures. Sufficient moisture must be present in the material to avoid degradation due to the temp. rise and the HCl formed. When H_2O is used, the HCl formed amounts to about 70% of the Cl consumed, while when 15% HCl is used as chlorinating medium about 60% is so formed. This results in a lignin chloride higher in Cl, and hence more sol. The use of an alk. extn. before chlorination removes resins and wood gums, and so improves the chlorination and considerably reduces both the amt. of Cl consumed and the amt. of NaOH used in the subsequent extn. With wood, it is advantageous to carry out the pretreatment under pressure, though with bamboo, as with cereal straws, this is without value, treatment with NaOH at 100° being sufficient. Thus, spruce consumes a total of 42% Cl and 28% NaOH when the first alk. treatment is carried out at 100°, but only 24 and 21%, resp., when a steam pressure of 5 atm. is used. By using the same alk. liquor for preliminary treatment and subsequent extn. a further saving of 5% NaOH may be obtained. In working with wood, it is necessary to use shavings or crushed chips, since the temperature of chlorination is low and penetration correspondingly slow. This may prove a disadvantage in making *pulp for paper.* However, pulps prepd. exptly. from spruce in this way, bleached, beaten in a Lampén mill, and made into hand sheets gave tests of 7000–9000 m. breaking length and 1000–6000 double folds. Photomicrographs, several of which are included, show the fiber to compare favorably with spruce sulfite pulp. Contrary to generally accepted views, about half the lignin chloride formed is sol. in H_2O. This is partially hydrolyzed to Cl-poor compds. insol. in org. reagents. Under proper chlorinating conditions (50° and 20% HCl) the lignin chloride formed is sol. in alc. (sulfite spirit). These conditions are too drastic for practical work however. In the practical temp. range, increase in time or acid concn. results in increased alc. soly. of the lignin chloride. This suggests that the mechanism is similar to that assumed for the sulfite process, namely, formation of an addn. compd. with lignin, and subsequent hydrolytic sepn. of this compd. from cellulose, acidity being an important factor. By controlling moisture, time and acidity the process may be regulated. If a preliminary treatment with HCl is given, and the acidity during chlorination is kept low, the cellulose degradation is reduced, pulp of 90% α-cellulose being obtained from spruce. The isolated lignin chloride is sol. in NaOH, and less sol. at higher temps. It is pptd. by $Ca(OH)_2$, so this would not be a satisfactory extn. agent. The *lignin chlorides* isolated from spruce, beech, poplar, bamboo and wheat straw contain about 27% Cl, and give mol. wts. (by b. p. in Me_2CO) of 1000–1200, which agrees well with the Cross and Bevan formula (26.5% Cl, mol. wt. 1091) but it is improbable that this lignin chloride is a simple compd. **Remarks.** H. WENZL. *Ibid* 1008–9.—The heat values given by Waentig were from lab. expts., while those of Wenzl are from actual practice, and hence not comparable. **Reply.** P. WAENTIG. *Ibid* 1009. R. H. D.

Lignin acetal. II. ERIK HÄGGLUND AND HELMUT URBAN. Institute for Wood Chemistry, Åbo, Finland. *Cellulosechemie* **9**, 49–53(1928); cf. *C. A.* **21**, 4065.—Boiling isolated lignin such as HCl-, HCl-H_3PO_4- and alkali-isolated lignins with amyl and butyl alcs. in the presence of HCl causes 80% of the lignin to go into soln. in combination with the alc. in approx. stoichiometric relations. These lignins are very similar to those obtained directly from wood. The undissolved lignin residues also take up alc. but in smaller quantity. The authors purified alc. lignin from wood by pptn. from AcOH

and detd. the mol. wt. by lowering of the f. p. in AcOH. It was found to be about 400. This mol. wt. corresponds to a compd. with 2(OH)-, $2(OCH_3)$- and a(CHO) group. Accordingly, the formula for the basic mol. of lignin can be resolved as follows: $C_{19}H_{11}O_2(CH_3O)_2(OH)_2CHO$ (mol. wt. 396.3). These investigations show that alc. is not taken up by combination with tautomeric reacting OH groups of lignin.
L. C. Fleck

The problem of wood supply. R. Schuchhart. *Wochbl. Papierfabr.* **59,** 655–9; *Papier-Fabr.* **26,** 413–7(1928).—An address. Authorities differ as to the possibility of a wood famine. As a matter of fact, accurate estimates of the available wood supply and annual consumption of the world are practically impossible. For Germany, the matter is one of careful utilization and increased reproduction. R. H. Doughty

The chemical decomposition of wood. Bror Holmberg. Techn. Hochschule, Stockholm. *Papier-Fabr.* **26,** 506–8(1928).—See *C. A.* **22,** 3293. R. H. Doughty

The manufacture of groundwood pulp. C. O. Bachman. *Paper Mill* **51,** No. 34, 20(1928).—Investigation into the reason why groundwood prepd. from the same wood under apparently the same conditions and having the same freeness test exhibits wide variations in Mullen and Elmendorf test values has shown that the formation and structure of the individual fibers have a direct bearing on the strength of the finished paper, particularly when made on high-speed machines. Microscopical examn. of groundwood paper having a high Mullen test showed the fibers to be curved and barbed, while in low-strength papers the fibers are smooth and straight. A. P.-C.

The digestion of wood with cooking acids of low sulfite content. VIII. Erik Hägglund. *Papierfabr.* **25,** Fest- und Ausland Heft 60–3(1927); cf. *C. A.* **22,** 684.—Cooking acids of low sulfite content are often used to speed up the digestion process. The acidity during the course of the digestion process is smaller with a large sulfite content than with a cooking liquor with a small sulfite content. In the first stage of the cooking there is very little difference between the 2 types of liquors because any changes in the H-ion concn. have no effect on the sulfite addn. and there are present no large quantities of lignosulfonic or sulfuric acids. During the later period of the digestion process acidity plays an important role: reducing sugars appear and the yield of pulp is markedly affected. With acid liquors of low sulfite content the pulps resulting therefrom are inferior in tearing length and folding endurance. The fiber has become brittle. J. L. Parsons

The pulping of pine wood by the sulfite process. II. Erik Hägglund. Institute for Wood Chemistry, Åbo, Finland. *Cellulosechemie* **9,** 38–43(1928).—In continuation of previous work (*C. A.* **21,** 1710), H. studied the conversion of benzene-ether-acetone-extd. pine wood by the sulfite process and found a great similarity to results obtained with spruce wood. Ether- or benzene- extd. wood cannot be cooked to pulp by the usual sulfite process because such wood still contains MeAc and alc.-sol. substances which prevent conversion. Unextd. pine wood can be cooked to pulp with excellent yields by the use of highly concd. $NaHSO_3$ solns. The pulp, however, still contains considerable resin and cannot be used for paper manuf. without deresinification. The Keebra process as described in patent literature gives poor results with pine wood. Pretreatment of spruce wood with a lime or NaOH soln. at 105° causes a change in the wood and a liberation of HCO_2H and AcOH. A satd. lime soln. causes 1% of the wt. of the wood to be liberated as AcOH. The treatment has no effect on the sulfite cook which follows. The pulps have higher ash contents but the lignin is normal. Pine heartwood extd. with benzene-acetone, then with lime, is not converted as well as without a pretreatment. When extd. with only benzene and followed with a pretreatment with lime the results were even poorer. A pretreatment with HCl is of no advantage. The pretreatment of unextd. pine wood with alkalies at 105° gave unfavorable results. The residues contained considerable lignin and could not be defibrinated. The ash content was exceedingly high. L. C. Fleck

Wood and pulp mucilage. Carl G. Schwalbe. *Papierfabr.* **25,** Tech.-Wiss. Teil, 481–5(1927).—Mucilage formation from mech. pulp depends not only on the compn. of the wood, but also on the grinder pressure, the sharpness of the stone, the density of the pulp, the temp., etc. Hemicelluloses, pectins and substances closely allied to sugars and cellulose are the best mucilage-formers in wood. Freshly cut wood can be converted into mucilage more easily than stored wood. Lignin is not a good mucilage-former. Mitscherlich pulps are superior to Ritter-Kellner pulps in the manuf. of mucilage. Its formation is facilitated by bacterial action, overcooking, overbleaching and by the addn. of certain chemicals to the beater, such as $LiCl_2$ and $Ca(SCN)_2$. The soly. of cellulose mucilage in 16% NaOH soln., its pptn. from this soln. and the detn. of the height level in a tube after centrifuging indicate the degree of

beating of the stock. The most important property of pulp mucilage for paper manufacturers is its ability to weld the fibers together while moist. This is favored by pressure and careful drying, the latter being done on both sides of the sheet at the same time to avoid a loosening of the felting of the fibers. J. L. PARSONS

Determination of wood gum in pulps. HERMANN BUBECK. *Papierfabr.* **25**, Tech.-Wiss. Teil, 617–20(1927).—An improved procedure for the detn. of the wood gum in sulfite pulps is given which yields results in 2–3 hrs. instead of 2–3 days required by former methods. Five g. finely disintegrated pulp in a wide-mouth bottle are treated with 100 cc. of 5 vol.-% NaOH at 18° for 1–2 hrs. The mixt. is shaken once. At the end of the extn. time the mixt. is filtered, 25 cc. of the filtrate pipetted off and oxidized with an excess of 1.5 *N* CrO_3 soln. contg. H_2SO_4. The soln. is dild. to 250 cc. and the excess of CrO_3 detd. in 50 cc. iodometrically. One cc. 1.5 *N* CrO_3 soln. equals 10.13 g. wood gum. The degree of disintegration of the pulp and the temp. of the reaction are important factors in this test. J. L. PARSONS

Determination of mechanical wood pulp in paper by the phloroglucinol method. KORN. *Zellstoff u. Papier* **7**, 315–9(1927).—Absorption of phloroglucinol reagent by groundwood fibers in paper is not const but there is little error at the end of 24 hrs. Factors for calcg. results are given as 6.48 for mech. pulps and 1.21 for sulfite pulps, while Krull and Mandelkow found 7.84 and 1.34 for similar pulps. The purity of the reagent appears to play a role in the detn. of these factors. The calcd. results are supposed to be very accurate and between the limits of 40 and 70% groundwood in paper the chem. procedure is more desirable than the microscopical estn. J. L. PARSONS

The fluorescence of wood pulps and vegetable tannin extracts. O. GERNGROSS, N. BÁN, G. SÁNDOR AND K. TSOU. *Papierfabr.* **25**, Tech.-Wiss. Teil 49–52(1927).—An exptl. lecture demonstrating the effect of ultra-violet light on wood pulps and tannin exts., both natural and synthetic. Waste sulfite prepns. for tanning fluoresce violet in ultra-violet light. Cellulose, viscose rayon, hydrocellulose, starch, etc, yield a violet fluorescence after immersion in spruce bark ext ; nitrocellulose behaves negatively. Quebracho wood ext. produces a yellow fluorescence on various kinds of cellulosic materials, and nitro- and acetylcellulose. The yellow color becomes less pronounced with the increase in N content of the nitro derivative. Disaccharides, such as lactose and sucrose, as well as decompn. products of proteins, do not absorb the violet or yellow fluorescent substances. Evidence is given that the fluorescent property is probably not due to sulfonic acids. Filter paper dipped into spruce bark ext. fluoresces similarly to unbleached sulfite pulp. The fluorescent compd. is slightly sol. in hot water, resists org. solvents, is sensitive to alkalies and chlorine, but is not attacked by acids. J. L. PARSONS

Testing wood pulp for strength. J. L. A. MACDONALD AND G. A. CRAMOND. *World's Paper Trade Rev.* **89**, 1620–30(1928); *Paper Maker & Brit. Paper Trade J.* **75**, 617–21(1928); *Paper Mill* **51**, No. 28, 20 4, 36(1928); *Paper Trade J.* **87**, No. 5, 51–3(1928).—A discussion of the necessity of devising and standardizing a suitable strength test for pulps and of the conditions which should be met by any proposed method. The crucial point of any such method lies in the prepn. of suitable uniform test sheets which can be duplicated not only by the same experimenter in the same lab., but by different experimenters in different labs. Using an electrically driven disintegrating propeller and suitable pulp container, an electrically driven pebble mill, a modified Wilen sheet-making machine, a hand-operated "ledger" press for couching, a hydraulic high-pressure press, an electrically heated drying cylinder and a conditioning chamber, the authors have been able to prep. sheets sufficiently uniform to give satisfactory results with the Mullen bursting strength test, for either unbeaten or beaten pulp. A. PAPINEAU-COUTURE

Testing the bleaching quality of wood pulp. H. L. JOACHIM. *Zellstoff u. Papier* **7**, 361–2(1927).—A permanganate method for testing the bleach requirement of pulps is described which yields results in 20 min. Ten g. air-dry pulp is suspended in a l. of water by stirring and the temp. adjusted in a water bath to 37°, 25 cc. dil H_2SO_4 (1:4) are added and the mass is stirred with an automatic stirrer. Twenty-five cc. 1 *N* $KMnO_4$ are run in through the lid of the container while the stirrer is in motion. After exactly 7 min. $H_2C_2O_4$ is run into the jar from a buret and the excess $KMnO_4$ destroyed. The acid should be added 0.5 cc. every 30 sec. until the end point is approached. The relationship between the result obtained from the titration and the amt. of bleach required for a pulp will depend upon mill practice and the type of pulp produced. Comparative tests are given with the $KMnO_4$ method of Johnsen and Parsons and the Cl method of Roe. J. L. PARSONS

Bleach studies on wood pulps. IV. The influence of metals and metallic salts on hypochlorites and the bleaching process. HERMANN WENZL. *Papierfabr.* 25, Fest- und Ausland Heft 76–85(1927).—A large no. of metals effect a catalytic decompn. of hypochlorites into chlorides and O. The activity of metals differs widely: Al, Pb, Zn and Fe are not as effective as Mn, Co and Ni. The reaction velocity decreases with increase in hypochlorite concn. and becomes const. Velocity is also retarded by increasing the OH ion, and is accelerated by elevating the temp. The rate of reaction must be adjusted so as to produce a uniform bleaching action without destroying the fiber. In industrial operation the catalyzer may be suspended as the metal or added in the form of a salt in the bleach mixt. Analyses of pulps bleached in this way showed lower Cu nos. and higher α-cellulose values than pulps bleached in the usual way.

J. L. PARSONS

The digestion of beech wood with nitric acid. HERMANN SUIDA AND HANS SADLER. Institut für chem. Technologie organischer Stoffe an der technischen Hochschule Wien. *Papierfabr.* 25, Fest- und Ausland Heft 93–7(1927).—A brief review is given of pulp-producing processes utilizing HNO_3. Superior penetration of beech wood is obtained by cutting the material into longitudinal strips 1–2 mm. thick, and then immersing them in HNO_3 of the correct concn. at ordinary temp. for 2–3 hrs. The acid is then poured off, the chips are put in a digester and kept at 79° in a water bath for an hour. The chips do not lose their structure until, after washing, they are treated with a hot 2% soln. of NaOH. A 15% HNO_3 soln. was found to give the best results. Its consumption during the cooking process amounted to about 30% of the wt. of the wood. The pulp yield was about 40% and the α-cellulose content of the product was 85% and its Cu no. varied from 2.3 to 3.1. A pulp of higher quality can be prepared by a treatment with 9% NaOH soln.

J. L. PARSONS

Chemistry of beech wood; acetylation of beech wood and cleavage of the acetyl-beech wood. HERMANN SUIDA AND HUBERT TITSCH. Techn. Hochschule Wien. *Ber.* **61B**, 1599–1604(1928).—To obtain light on the state of the chief constituents of wood in their natural union, the free active groups in the wood should be protected and fixed by substituents in such a way that the union between the chief constituents themselves is in no way affected, and when these constituents are subsequently sepd. from each other the operation should be such that the protected active groups are not altered. S. and T. began work along these lines some time ago and now publish the results so far obtained because of the appearance of Fuchs' paper (*C. A.* **22**, 2744). Preliminary expts. showed that acetylation of the material used (red beech wood) with Ac_2O yields a product which, although lighter in color than the wood, otherwise has the same appearance as the latter and yields up no appreciable quantity of matter to the usual solvents. Most of the weaker catalysts (HNO_2, $ZnCl_2$, $Cu(OAc)_2$) are without influence up to a certain temp. range. Dil. H_2SO_4 behaves similarly while higher concns. produce an unmistakable hydrolysis of the wood. Acetylating mixts. which suffice to acetylate free cellulose do not acetylate wood more than does Ac_2O at a higher temp., but at the same time they produce Me_2CO-sol. products. These Me_2CO-sol. parts contain cellulose and incrustation substance in approx. the same proportion as that in which they are present in wood itself, *i. e.*, perhaps after wood has thus been made sol. there is still a certain union between the wood constituents. S. and T.'s expts. indicate that only acetylation with Ac_2O, with or without C_5H_5N, gives reliable results; under such conditions there is no hydrolysis of the wood. To remove the hemicelluloses as completely as possible the deresinated wood flour was freed of gum by the Friedrich and Diwald method; that the greater part of the furfural-yielding substances remains in the wood was confirmed. The wood flour was then boiled with Ac_2O. The max. acetylation was attained in 14 hrs.; the wood then contained about 32% AcOH (37% if C_5H_5N was used). Even without C_5H_5N the aniline sulfate reaction disappears completely, while phloroglucinol-HCl still gives a very faint pink color which also disappears after a reacetylation with C_5H_5N, when the AcOH content increases to about 35%. Sepn. of the wood constituents without splitting off the AcO groups proved difficult. To be sure, these groups are not held as loosely as had at first been feared. They are not split off by H_2O and even after several hrs. boiling with 2.5% H_2SO_4, the acetylated wood loses only about 4% AcOH. Towards alkalies they are more sensitive and they are split off by Friedrich and Diwald's method of hydrolysis with alc. HCl. Hydrolysis with AcOH contg. 0.25% HCl proved satisfactory, although some AcOH is split off. After 2 hrs. boiling H_2O pptd. 18.9% acetyl lignin and the residue (still contg. lignin) amounted to 55.5% of the total wt. The lignin part contained 28.9% AcOH and 14.10% MeO, the cellulose part 25.8% AcOH, 1.38% MeO and 20.6% xylan. On the basis of AcO-free lignin, the MeO content is 19.84%,

which corresponds to a primary lignin. Some side reactions also occur in such a hydrolysis; about 1/3 of the MeO in the acetylwood (originally 5.11%) is lost, presumably with the lignin in the H_2O-sol. portion. The acetyllignin so obtained is light yellow, not as white as that obtained by the alc. HCl method. The cellulose isolated from the same acetylated wood by the Cross and Bevan method contained 15.8% xylan and 29.1% AcOH. C. A. R.

Methylation of beech wood and cleavage of the methylbeech wood. ANTON VON WACEK. Techn. Hochschule Wien. *Ber.* **61B**, 1604-9(1928); cf. preceding abstr.—Methylation of the wood flour described in the preceding abstr. gave a product considerably lighter than the original material but otherwise entirely similar to it. After 5-7 methylations a max. MeO content of 39-39.4% was attained. The product does not change in solvents of methylcellulose and lignin, does not swell and hardly dissolves even in traces. If, after cold hydrolysis with 17% HCl according to Friedrich, it is refluxed with alc., 70-7% dissolves and the residue forms a swollen gelatinous mass From the alc. H_2O reppts. about 28%, the rest partly remaining in soln. and partly sepg. on heating in white flocks which redissolve on cooling. The part pptd. by H_2O contains 36-8% MeO, which is considerably higher than the value for an exhaustively methylated isolated lignin, so that apparently some cellulose ether is also pptd. The part flocculating out on heating dries to a white powder with 42.7-43% MeO (calcd. for trimethylcellulose 45.6%). If the hydrolyzed product is refluxed with Me_2CO instead of EtOH, there remains 64-6% of a very light, not at all swollen residue, 28% of which dissolves on 5-fold extn. with ice-cold H_2O (a 2nd hydrolysis of the H_2O-insol. part gives a product again partly sol. in H_2O); the substance flocculating out on heating the H_2O soln. contains 40.3-41.5% MeO after the 1st hydrolysis, 40.65% after the 2nd hydrolysis, and the H_2O-insol. part (after the 1st hydrolysis) dissolves to the extent of 33% in $CHCl_3$, the $CHCl_3$-sol. product contg. 40.71% MeO. From the original Me_2CO soln. H_2O ppts. a product with 26.48% MeO The above MeO values of 40.3-43.2% MeO correspond to trimethylcellulose mixed with 41-18.8% of dimethylcellulose. Since this trimethylcellulose does not dissolve before hydrolysis it may be concluded that this part, at least, of the cellulose is not combined through its three HO groups in the wood C. A. R.

The digestion of plant materials with dilute nitric acid. P. KRAIS, K. BILTZ AND O. RENNER. Deutschen Forschungsinst. fur Textilind. in Dresden. *Papierfabr.* **25**, Fest- und Ausland Heft 43-4(1927).—From 400-900 kg. straw, reeds and similar material have been successfully digested using dil. HNO_3 but the consumption of chem. was somewhat larger than with lab expts. The Cu nos of the pulps were not higher than 2.7 and the α-cellulose content (Jentgen method) varied from 79 to 86 for bleached pulps, which figures are comparable with sulfite pulp. Small amts. of HCN are produced in the process, accompanied by N oxides. J. L. PARSONS

The measurement of the viscosity of groundwood with the Schopper-Riegler apparatus. WALTER BRECHT AND ERICH SCHAUN. *Papierfabr.* **25**, Fest- und Ausland Heft, 45-60(1927).—The most favorable conditions for the operation of the Schopper-Riegler app. in detg. the viscosity of groundwood were investigated. For this purpose a graph is shown in order that all values may be referred to 20°. Sources of errors and their limits are tabulated. A stock density of 0.3% in 1000 cc. of suspension is recommended, with a temp. of 20°. The prepn. of this suspension is facilitated by the prepn. of a standard cake of fibers under certain conditions of pressure, namely 445 g. per sq. cm. The calcd. amt. of this cake to give 3 g. is then used for the suspension. A comparison is drawn with the Canadian standard freeness tester. J. L. PARSONS

Nitration of wood pulp by the Planchon process. G. PAYRAS. *Rev. gén. mat. plastiques* **4**, 515, 517(1928).—A brief description of the process, which consists essentially in immersing the pulp in sheet form in a bath of suitable compn. to obtain the desired degree of nitration. The temp. is kept const. (at or below 15°), and the time required is inversely as the temp. A. PAPINEAU-COUTURE

Pulping flax straw. EARL R. SCHAFER AND CLIFFORD E. PETERSON. Forest Products Lab., Madison, Wis. *Paper Mill* **51**, No. 41, 2, 10-8, 35(1928); cf. *C. A.* **21**, 1351; **22**, 1681.—Results are given in detail of the pulping of flax straw by the Cl process on a semi-commercial scale. The objective of producing pulps suitable for the better grades of paper was not entirely achieved. The pulps produced by the Cl process are very easily hydrated and consequently cannot be refined after the Cl treatment. The mech. processing must be done after the alk. digestion and prior to chlorination. Such mech. treatment is accomplished quite efficiently in a rod mill at moderately high consistencies. Steel rods or a steel lining in the mill cannot be used because

of the resulting contamination of the pulp with Fe. The phys. properties of the Cl flax pulps are largely dependent on the degree of pulping accomplished in the alk. digestion. The more raw pulps require proportionately a greater amount of Cl and the resulting waterleaf papers are, in general, proportionately more hydrated. While the variations in quality that can be attributed to the kinds of chemicals used in the predigestion are of less importance than the degree of pulping accomplished, certain advantages in the use of the sulfate process over the soda process have been noted. The chlorinated pulp that has been produced by a predigestion with Na_2SO_3 is slightly brighter in color and higher in strength than the "sulfate," but is more hydrated. The strength of Cl flax papers is generally higher when prepd. from the pulps requiring higher amts. of Cl, presumably because of the higher degree of hydration. The degree of whiteness of the paper, on the other hand, is higher with pulps that require the lower amts. of Cl. The color of Cl pulp prepd. from the entire flax straw is at best a grayish white. The addn. of small amts. of soda wood pulp to the Cl flax pulp furnish increases the opacity, reduces the hardness, and slightly reduces the strength of the waterleaf paper. None of the papers produced was in itself of commercial quality. The improvement in technic that would be possible in a commercial operation would undoubtedly eliminate many of the defects. Several of the exptl. papers indicate the possibility of incorporation of Cl flax pulps in the furnish of high-grade papers.

A. PAPINEAU-COUTURE

The problem of the technical utilization of chlorine for the decomposition of plant fibers. P. WAENTIG. *Papierfabr.* **25**, Tech.-Wiss. Teil, 144-8(1927).—A reply to a criticism by Wenzl in which calorimetric measurements of the chlorination process and the practical significance of these data are doubted. Direct measurements of the heat evolved during treatment with gaseous Cl are difficult because of the formation of HCl, which at high concns affects the reaction. There is no fundamental difference between the use of Cl gas and Cl water in the decompn. of plant fibers: in both cases a certain amt. of water must be present in the fibers in order that the reaction may proceed at all. The yields and nature of the cellulose obtained are similar. The possibility of the decompn. of wood into its fibers by Cl depends on the degree of division of the raw material. **Reply.** H. WENZL. *Ibid* 148-9.—The statements of Waentig are contradicted on the basis of actual experience. J. L. PARSONS

The technical use of chlorine in the decomposition of plant fibers. P. WAENTIG. H. WENZL. *Papierfabr.* **25**, Tech.-Wiss. Teil 340-2(1927).—A polemic discussion.

J. L. PARSONS

Fluorescence of pine bark, pine wood, sulfite pulp and liquor. O. GERNGROSS. *Z. angew. Chem.* **41**, 50-1(1928); cf. Gerngross, Bán and Sándor, *C. A.* **20**, 517; **23**, 839(1926); Gerngross, *et al.*, *Ibid* **1927**, 137.—A reply to the criticisms of Hägglund and Johnson (*C. A.* **22**, 1679). Pine wood on heating for a short time with dilute HCl yields a soln. with a weak reddish fluorescence in ultra-violet light, while cotton wool dipped in this soln. acquires a strong violet fluorescence similar to that shown by the aq. ext. of pine wood obtained by boiling under pressure. These observations are not in accordance with the view of Hägglund and Johnson that the fluorescence of sulfite pulp is due to the presence of lignosulfonic acid. B. C. A.

Fluorescence of sulfite pulp. E. HÄGGLUND AND T. JOHNSON. *Z. angew. Chem.* **41**, 51(1928).—A brief reply to G. (cf. preceding abstr.). B. C. A.

Constituents of the fiber of Japanese hemp-palm and sponge-gourd. S. MASUDA. *Cellulose Ind., Tokyo* **3**, 321-3(1927).—The fibers, which are very resistant to decay in water, were purified mech., cut up and analyzed. The results (calcd. on dry material) for hemp-palm (*Trachycarpus excelsus*, Wendl), and sponge-gourd (*Luffa cylindrica*, L., Roem), resp., are: water, 11.34% (12.65%); benzene ext. 0.77% (0.44%); alc. ext. 1.39% (2.9%); cellulose (on the extd., dry substance) 42.6% (57.65%); reducible sugar, after hydrolysis of the isolated cellulose, 92.3% (99.7%) of the theoretical yield; lignin 37.5% (14%) with 0.54% (0.18%) of ash; and pentosan 16.8% (18.6%). Mucic acid was not isolated and only a trace of mannose hydrazone was obtained from hemp-palm fibers, while those from sponge-gourd contained mannan 0.4%, galactan 1.8%. In both products, after hydrolysis with 3% H_2SO_4, xylose was identified.

B. C. A.

The storage of beaten stock. W. SCHMID. *Papierfabr.* **25**, Tech.-Wiss. Teil, 20-2 (1927).—Neutral, hygroscopic substances may be added to paper stock in a kollergang to prevent the disintegrated material from becoming hard on storage. J. L. P.

Is the usual formula for calculating the thickness of plates in cylindrical covers to containers subjected to interior pressure correct? F. VON ZEIPEL. *Svensk Pappers-Tid.* **31**, 441-2 (1928); cf. *C. A.* **20**, 3813.—A preliminary study of formulas derived

from the general formula $s \quad p.D/2k$ to show that certain revisions are necessary.
W. SEGERBLOM

Is the formula for the strength of dome-shaped ends of containers designed for interior pressure correct? F. VON ZEIPEL. *Svensk Pappers-Tid.* **31,** 576–7(1928); cf. preceding abstract and *C. A.* **22,** 1849.—Explosions of steam boilers have made necessary multiplying the safety factor of the strength formula by the coefficient ψ, which varies with the radius of curvature. The Godesberg curve is given showing the relation of ψ to ends of varying curvature. W. SEGERBLOM

Pulp and paper work at Madison. C. P. WINSLOW AND C. C. HERITAGE. Forest Products Lab., Madison, Wis. *Paper Mill* **51,** No. 41, 9, 43–4(1928).—An outline of the work the pulp and paper division of the lab. is carrying out in coöperation with the pulp and paper industry on problems related to that industry. A. P.-C.

Science and the paper industry. E. ARNOULD. *Industrie papetière* **7,** 201–13 (1928).—An address showing the empiricism which still prevails in the paper industry and the lack of a proper scientific understanding of practically all the stages of the conversion of pulp into finished paper. A. PAPINEAU-COUTURE

Measuring pulp and wood values. C. K. TEXTOR. Northwest Paper Co. *Paper Mill* **51,** No. 40, 5–6(1928).—A brief discussion of the importance of devising tests which will give a true and reliable indication of the pulp-making qualities of woods and of the paper-making qualities of pulps. A. PAPINEAU-COUTURE

Technical control for board mills. E. FRANK WHITTINGTON. Sutherland Paper Co. *Paper Mill* **51,** No. 39, 28, 36(1928).—A discussion of the control required in board mills, suggesting the following: analysis of incoming raw materials (water, pulp and shavings, size, alum and fillers), weighing of beater furnish, check of size and alum solns., detn. of the p_H, freeness and consistency of the beater furnish, detn. of the basis wt., caliper, H_2O content, degree of sizing, surface finish or gloss, ash content and bursting, tensile and folding strengths of the finished board. A. PAPINEAU-COUTURE

Control of losses in (pulp and paper) manufacturing processes. WALTER BRECHT. *Papier-Fabr.* **26,** 469–73(1928).—General. Raw materials, finished products and wastes of all processes should be systematically checked. The use of controlling and recording instruments, some of which are described, is recommended. Losses not only of material, but of time, steam, power, etc., should be considered. R. H. D.

Technical men and the new competition (in the paper industry). D. C. EVEREST. *Paper Trade J.* **87,** No. 15, 38–44(1928).—An address. The present conditions of keen competition and excess productive capacity over consumption existing in the paper industry are attributed to the progress which has taken place in manufg. processes through the efforts of technical men. The remedies suggested are either legislation to regulate production according to demand or development of new uses for the finished products so as to increase consumption, with possibly best results being obtained by a combination of the two. A. PAPINEAU-COUTURE

Refractories (in the pulp and paper industry). REGINALD TRAUTSCHOLD. *Paper Trade J.* **87,** No. 14, 44–8(1928).—A brief discussion of the functions and advantages of air-cooled furnace walls and of refractory applications in pulping (lining digesters, acid towers and lime kilns). A. PAPINEAU-COUTURE

United States patents on paper making. CLARENCE J. WEST. National Research Council, Washington. *Paper Trade J.* **87,** No. 5, 58–9(1928); cf. *C. A.* **22,** 3296.—A list of U. S. pats. on paper making issued in April, May and June, 1928.
A. PAPINEAU-COUTURE

The foaming of paper stock. H. ROSCHIER. *Pappers och Travarutidskrift for Finland,* No. 20(1926); *Papierfabr.* **25,** Tech.-Wiss. Teil 211–3(1927).—The theory of foam formation is discussed. A pure Na abietate soln., to which $Al_2(SO_4)_3$ has been added, does not yield foam at p_H 4.6–5.8. The abietic acid at this p_H is in the form of the Al salt, which is difficultly sol. in water. $Al_2(SO_4)_3$ does not influence the surface tension of water. Com. rosin always yields a foam over the above p_H range, increasing with increase in H-ion concn. The foaming is least at p_H 4.5–5.5 when glue or gelatin (even as low as 0.09%) is added as a protective colloid. Sources of foam in paper stock are: fillers, sizing agents, improperly washed pulp contg. bleach residues, unbleached pulp contg. traces of waste sulfite liquor, $Al_2(SO_4)_3$ after hydrolysis, etc. Often the addn. of another colloidal substance to a foaming soln. decreases the amt. of foam by displacement from the surface of the soln. J. L. PARSONS

Paper from cornstalks. E. F. HULBERT. Cornstalk Products Co. *Paper Trade J.* **87,** No. 13, 51–4(1928); *Paper Mill* **51,** No. 39, 12, 38(1928).—An outline of the work done by the Euromerican Cellulose Products Corp. and the Cornstalk Products Co. on the production of paper pulp and of high α cellulose for rayon manuf. from corn-

stalks, with a description of the process used and of the 25-ton mill at Danville, Ill. (1) Cornstalk waste can be successfully gathered and delivered to the pulp mill at a price that makes its commercial use as a possible substitute for wood pulps an attractive venture. (2) A clean, high-bleached white pulp suitable for the production of many grades of white papers can be produced in 35–45% yield (on the dry wt. of the stalk) at a price below that of chem. wood pulp. (3) The character of the pulp produced can be more or less controlled by proper control of the raw material in growing and gathering. (4) The pulp reacts very quickly to certain handling in the process and complete hydration can be accomplished almost instantaneously and almost as quickly it can be dehydrated and a free soft pulp obtained. (5) Almost any quality found in wood-pulp papers can be reproduced with 100% corn pulp. (6) Newsprint equal in strength and quality to that at present made can be produced from 10% sulfite and 90% corn. (7) Corn board takes coloring and finishing the same as wood-pulp board and has a good bending test; corrugating sheet made from corn has much greater strength than that made from straw and has a very high compressive strength. (8) Completely refined pulp can be made without the use of beaters, and completely hydrated pulp can be made without the use of beaters or chemicals. A. P.-C.

The paper-making qualities of woods and plants from Indo-China. F. Heim de Balsac and A. Deforge. Station Biol. d'Auteuil-Boulogne. *Chimie et industrie* **Special No.,** 592–5(April, 1928).—The pulp yields and fiber measurements of 56 Indo-Chinese trees and plants (designated by both their native and botanical names) are tabulated. The results show that a no. of these fibers would be suitable for paper making. A. Papineau-Couture

Degree of sizing and finish. H. Schwalbe. *Papierfabr.* **25,** Tech.-Wiss. Teil, 173–6(1927).—A short review is given of recent methods for detg. the sizing of paper. The app. of Albrecht is described. The methods of Albrecht and Klemm do not yield comparable results. As a rule the degree of sizing is reduced with increase in finish due to calendering. J. L. Parsons

Advance in sizing paper and pulp (with wax). E. Belani. *Papier-Fabr.* **26,** Amt. und Wirtschaft. Teil, 485–7(1928).—The advantages of wax sizing are enumerated, and practical suggestions for the application of the trade-named product "*Prestokoll.*" are given. R. H. Doughty

The rosin sizing of paper. I. Historical review. S. R. Olsen. Univ. of Minn. *Paper Trade J.* **87,** No. 15, 59–63(1928).—A review, bringing out the lack of fundamental research. In connection with the apparent contradictions in the results obtained and theories propounded by different investigators, no mention is made of Roschier's work (*C. A.* **22,** 1851, 3299), possibly because the article was prepd. before this work had been published. A. Papineau-Couture

Surface sizing. H. Postl. *Papierfabr.* **25,** Tech.-Wiss. Teil, 115–7(1927).—A brief description of surface-sizing practice in the paper industry. J. L. Parsons

The dispersion of rosin for paper sizing. Pierre Delcroix. Papeteries Navarre. *Pulp Paper Mag. Can.* **26,** 1049–51(1928).—See *C. A.* **22,** 1853. A. P.-C.

Hard water and rosin-size emulsions. C. N. Ridley. *Paper Makers' Monthly J.* **66,** 415–9(1928).—A discussion of the effects of the permanent hardness of H_2O on the pptn. of rosin from size emulsions. Expts. are described showing that the amt. of rosin deposited from emulsions is not in direct proportion to the increase in hardness but increases more rapidly than the hardness because of the weakening of the stabilizing film of Na resinate through the action of the Ca and Mg salts in the water. The rate of sepn. of rosin from its emulsion increases more rapidly with water contg. permanent hardness alone than with water contg. both permanent and temporary hardness, which is explained by the fact that Na_2CO_3 set free by the action of the temporary hardness on the Na resinate reacts with the permanent hardness of the water and prevents it from affecting the resinate. A. Papineau-Couture

Control of stock losses in the paper mill. A. T. Gardner. Combined Locks Paper Co. *Paper Trade J.* **87,** No. 14, 61–2(1928); *Paper Mill* **51,** No. 40, 16, 36(1928).—A discussion of the importance of making a complete survey of the mill, so that all the small losses which make up the total loss can be detd., with general indications as to how to obtain best results in fiber recovery from white water and a description of a satisfactory reclaiming system in use in a book-paper mill. A. P.-C.

White-water re-use. L. M. Booth. *Paper Trade J.* **87,** No. 12, 55(1928).—A brief discussion showing that the white-water problem should be viewed as one of paper making rather than as one of waste recovery. A. Papineau-Couture

Manufacture of wadding from cellulose. J. A. Colin. *Mon. papeterie belge* **8,**

391–7(1928).—A detailed description of the raw materials used and of the equipment and process utilized for its manuf. A. PAPINEAU-COUTURE

Measuring the color of paper. JEAN COUTROT. *Mon. papeterie française* **59,** 135–9(1928).—A description of the T. C. B photo-colorimeter and of its application to the measurement of the color and gloss of paper. A. PAPINEAU-COUTURE

The yellowing of paper. M. MARINI. *Paper Trade J.* **87,** No. 5, 59–60(1928).—See *C. A.* **21,** 2188. A. PAPINEAU-COUTURE

Schur's freeness indicator and refining control. M. O. SCHUR. *Paper Trade J.* **87,** No. 2, 55–62(1928).—A description of U. S. pat. 1,653,125 (*C. A.* **22,** 868). A. PAPINEAU-COUTURE

Determination of opacity of paper. ANON. *Paper Trade J.* **87,** No. 10, 64(1928).—A detailed description of the official method of the Techn. Assoc. of the Pulp and Paper Industry. A. PAPINEAU-COUTURE

Measuring the bulk of paper. ANON. *Paper Trade J.* **87,** No. 8, 51(1928).—An outline is given of the investigation carried out at the U. S. Bur. of Standards with a view to developing a standard method for measuring the bulk of paper. Two proposed methods are described. A. PAPINEAU-COUTURE

Fastness measurements for colored papers. G. DALEN AND P. WILKE. *Paper Trade J.* **87,** No. 7, 58–60(1928).—From qual. tests with the quartz-mercury lamp it is concluded that it should furnish a satisfactory substitute for sunlight in making fading tests on papers. One hour of lamplight is equiv. to 3 hrs. of direct sunlight or to 10 days of north daylight, under the conditions used. Temp. and water content of the sample affect the results; activation of the air by the lamp apparently does not. Aging of the lamp is not a serious factor after it has been operated a few hrs. A. P.-C.

Further notes on freeness testing. D. S. DAVIS International Paper Co. *Pulp Paper Mag. Can.* **26,** 1055–7(1928); cf *C. A.* **21,** 1710.—An exptl. and mathematical comparison of the 3 types (so-called "50-50" model, 1925 model, 1927 model) of the Williams Model "B" freeness tester showed that the calibration of the 1927 tester is, like that of the earlier models, independent of the properties of any pulp. The readings obtained with the 1925 and 1927 instruments agree on water alone, but differ on pulp samples. The linear relationship between the reciprocal of the freeness and consistency of the stock holds with the 1927 as with the 1925 model. Conversion between the 3 freeness scales is possible by means of plots and equations which are given, and the effect of temp. on freeness is susceptible of fairly simple mathematical treatment, whatever the freeness scale. A. PAPINEAU-COUTURE

Detection of formaldehyde in paper. T. C. BENTZEN. Whiting-Plover Paper Co. *Paper Trade J.* **87,** No. 3, 49(1928); *Paper Mill* **51,** No. 30, 18(1928); cf. *C. A.* **21,** 2983.—As a preliminary test add a little resorcinol to 50 cc. of 27% NaOH soln., immerse about 1 g. of paper and boil 30 min. If no red color develops it is proof of the absence of CH_2O. If a red color develops the presence of CH_2O should be confirmed by distg. about 1 g. of finely ground paper in the presence of 50–100 cc. distd. H_2O and testing the distillate by one or more of the following methods: Nessler's reagent, resorcinol test, Ag mirror test, $PhNH_2$ test. A. PAPINEAU-COUTURE

Determination of gloss of paper. ANON. *Paper Trade J.* **87,** No. 11, 55(1928).—A detailed description of the official method of the Tech. Assoc. of the Pulp and Paper Industry. A. PAPINEAU-COUTURE

Investigations on the fluorescence of papers. M. FALLOT. *Chimie et industrie* **Special No.,** 596–8(April, 1928).—Examn. of various paper-making materials by means of ultra-violet light filtered through a Wood screen (which eliminates practically all light except that of λ = 3650 A. U.) led to the following conclusions: Of 10 varieties of wood from Southern France, 9 gave a more or less brownish violet fluorescence and 1 (acacia) a very bright yellow fluorescence. Of 70 pulps prepd. from about 40 different fibers, all those carefully prepd. in the lab. had a very slightly pinkish white fluorescence, commercial bleached pulps had a fairly light violet fluorescence, and unbleached and mech. pulps had a brown fluorescence, the depth of which varied with the purity of the pulp. Papers prepd. from spruce soda pulp had a brownish (Havana shade) fluorescence whether loaded with kaolin, talc, $CaSO_4$ or $BaSO_4$, or whether sized with rosin, starch or gelatin. Under similar conditions, papers prepd. from unbleached spruce sulfite all had a more or less bright violet fluorescence and those made from cotton a more or less pronounced pinkish fluorescence. As a rule fillers deepen the color of the fluorescence and sizing (especially with rosin) makes it lighter; but at times there is no appreciable difference. Dyes give the paper the fluorescence characteristic of the dye. Photographic films were wrapped in different papers which had been exposed for 15 min. to light of 3650 A. U. and were kept in the dark for 2 months, after which

they were developed. The results showed that all papers made from rags or from properly bleached pulps (whether produced in the lab. or commercially) were without effect; but the ones made from pulps contg. impurities caused some fogging, unbleached sulfite being somewhat less active than unbleached soda pulp. A com. so-called "hemp" pulp, which fogged the film, was found to contain hemp stalks, while others sold as "rag" were loaded with about 5% $CaCO_3$. The fogging action of newsprint is due chiefly to its groundwood content, and very seldom to the printing ink. As regards the action of fillers, the results indicate that $BaSO_4$ has the greatest effect, $CaSO_4$ has less, china clay still less, and talc none at all; but the behavior of these substances probably varies according to their origin and compn. On the whole, rosin size has a greater action than gelatin or starch. Red and black aniline dyes generally reduce the fluorescence; certain grades of lampblack have a distinct effect, possibly on account of the impurities which they contain; of a no. of dyes studied, acid and basic dyes (even the blacks) had a fairly strong fogging action, while direct dyes were much less active, Oxydiazol Black NJEE being without noticeable action. A. P.-C.

The development of vacuum (paper machine) dryers. W. Schmid. *Papier-Fabr.* **26,** 537-40(1928).—The development of the Minton dryer as shown by German patents is traced. Its advantages are, savings in heat, space and felt cost, and greatly decreased paper shrinkage. R. H. Doughty

The vacuum method of drying paper. Ogden Minton. *Paper Trade J.* **87,** No. 11, 57-62(1928).—A discussion of the merits and performance of the Minton vacuum dryer, based on the results obtained with the com. dryer installed at the Kenogami mill of Price Bros. in Dec. 1926, showing that the claims made by M. in 1922 (before such a dryer had been constructed and tried out on a com. scale) concerning the superiority of vacuum drying have now been proved in actual practice. A. P.-C.

The Fidalgo pulp-drying system. R. D. Kehoe. *Paper Trade J.* **86,** No. 26, 50-2(1928).—A discussion of the merits of the process and of improvements being worked out in the equipment used in carrying it out. Results of tests are given showing that the strength of pulp dried by this process is but very slightly lower than that of moist lap pulp. A. Papineau-Couture

Radio moisture tester (for paper-making machines). James d'A. Clark. *Pulp Paper Mag. Can.* **26,** 1124-6(1928).—A complete description of Eng. pat. 275,741 (*C. A.* **22,** 2331), covering a device for detg., indicating and controlling the moisture content and quality of paper on the paper-making machine. A. Papineau-Couture

Pre-drying of paper. Wm. P. Argy. *Paper Mill* **51,** No. 28, 12(1928).—It was found that by pre-heating the paper before putting it through the last press the steam required to dry the paper is considerably reduced, resulting in a lowered steam consumption for a given output or in greater output with the same steam input into the dryers. A. Papineau-Couture

An improved humidity chart (for paper-mill use). D. S. Davis. International Paper Co. *Pulp Paper Mag. Can.* **26,** 1158-60(1928).—A description of a humidity chart which is an improved form of a chart given by Walker, Lewis and McAdams in their "Principles of Chem. Engineering," McGraw-Hill (1927) (*C. A.* **22,** 649), and which has been found particularly suitable to paper-mill problems. It has a temp. range of 0–150° F., and a humidity range of 0-80 lb. H_2O vapor per 1000 lb. dry air. The method of using the chart is explained by means of an example.
A. Papineau-Couture

Paper coating. H. E. Hutton. *World's Paper Trade Rev.* **89,** 1788–94, 1878–82, 1938, 1940(1928); *Paper Mill* **51,** No. 25, 18–26(1928).—A description of the manuf. of coated papers, outlining the variations in treatment to which it is subjected according to its destination. A. Papineau-Couture

Dyeing paper with direct colors. Fred Grove-Palmer. *Paper Maker & Brit. Paper Trade J.* **76,** 21, 23(1928); *Pulp Paper Mag. Can.* **26,** 1127–9(1928).—A brief general description of the uses for which direct dyes are used for coloring paper and of the precautions to be taken. A. Papineau-Couture

Basic colors for dyeing paper. Fred Grove-Palmer. *Paper Trade J.* **87,** No. 5, 56–7(1928).—A brief description of the technic of the dyeing of paper with basic dyes.
A. Papineau-Couture

The manufacture of safety paper. I. Special paper structures. Joseph Rossman. *Paper Trade J.* **87,** No. 10, 61–4(1928).—Abstracts of U. S. pats. on the production of safety paper by the incorporation of the materials during the paper making. **II. Chemical surfacing of paper.** *Ibid* No. 12, 56–60.—Abstracts of U. S. pats. on methods of making safety paper in which the finished paper is treated superficially in some way

as by impregnation with chemicals which will be discolored by ink eradicators, or is subjected to special printing methods. A. PAPINEAU-COUTURE

Possibilities of the jordan. G. S. BRAZEAU. *Paper Ind.* **10**, 664–5(1928); *Paper Trade J.* **87**, No. 4, 53–4(1928).—A brief discussion of the possibility of eliminating beaters in the treatment of pulp by hydrating it exclusively in jordans, and of the factors which make an efficient jordan. A. PAPINEAU-COUTURE

Processes for deinking paper. JOSEPH ROSSMAN. *Paper Trade J.* **87**, No. 3, 50–5(1928).—Abstracts of U. S. and foreign pats. dating as far back as 1800. A. PAPINEAU-COUTURE

Technology of ink removal from paper. R. EDMUNDS. *Papierfabr.* **25**, Tech.-Wiss. Teil, 75–6(1927).—The Baskerville and Stevenson process for deinking paper is described. Better results are claimed by using 90 kg. anhyd. Na_2CO_3 per ton of old paper. The recovery of book paper is discussed. J. L. PARSONS

The world production of newsprint paper, with especial reference to the United States and Canada. W. SCHMID. *Papier-Fabr.* **26**, 475–81(1928).—World figures on production and consumption for 1926 are analyzed. The increase in production in North America in the period 1913–26 is discussed. R. H. DOUGHTY

"Lignocell" paper. VON POSSANNER. *Papierfabr.* **25**, Tech.-Wiss. Teil, 601–3(1927).—The "lignocell" process for mfg. pulp is a modification of the method for producing steamed mech. pulp. Advantages of "lignocell" compared to mech. pulp are (1) the stock is lighter colored, permitting lighter dyeings; (2) opacity is good, allowing the manuf. of thinner papers; (3) conversion to paper is easier; (4) fibers possess superior felting qualities; and (5) the fibers are practically acid-free, which is not the case with mech. pulp fibers. "Lignocell" paper has a good feel and crackle and possesses a tearing strength very close to that of paper made from chem. wood pulp. Five photomicrographs accompany the article. J. L. PARSONS

Influence of atmospheric moisture on the bursting strength of paper. CHARLOTTE BOERNER. Staatlichen Materialprüfungsamt, Berlin-Dahlem. *Papier-Fabr.* **26**, 521–2; *Wochbl. Papierfabr.* **59**, 910–11(1928).—Of 13 samples tested, all showed an increase in burst (Mullen) on decreasing the relative humidity from 90 to 65%. On decreasing it further to 40%, 8 samples showed higher strength than at 65%, 5 somewhat lower. R. H. DOUGHTY

Proper working of waste-recovery apparatus in paper mills. G. CESCONI. *Bol. staz. sper. carta e fibre veg.* **1928**, 64–6.—With Fe recovery vats, the joints of the plates, the heads of the nails and solderings all collect solid matter that is detached in time and may enter the paper. Hence, all vats should be of concrete. To insure the return of clean water to the paper machine, the surface touched by the H_2O must be smooth, visible and accessible, so as to facilitate cleaning. Fe pipes cause impurities, rust and deposits. Zinked pipes without joints avoid these. Froth must be avoided, and if formed should be eliminated. R. SANSONE

The "kerosene" test for roofing felt. P. W. CODWISE. Certainteed Products Co. *Paper Trade J.* **87**, No. 12, 60(1928); cf. *C. A.* **22**, 1837.—The test consists essentially in satg. the sample of dry felt with a measured vol. of kerosene, which is considered to be a suitable liquid saturant, to det. the amt. of voids in the sample so as to calc. therefrom the theoretically possible % of asphalt satn. The technic of the test is described in detail. A. PAPINEAU-COUTURE

The strength of grinding stones. GOSTA M. JOHANSSON. *Svensk Pappers-Tid.* **31**, 469–72(1928).—By means of mathematical considerations J. concludes that pulling strain is the only essential danger to grinding stones. Flying apart of stones can be best prevented by reducing the peripheral speed and the pressure on the surface. J. recommends investigation (*a*) in a chem. lab. of the chem. and phys. compn. of grinding stones when fresh, and after 1 and 2 years' aging, and (*b*) in a mech. lab. of the strength against pressure and strain when fresh and after 1 and 2 years, aging. W. S.

Effect of sulfite waste liquor on the acidity of river water (ÖMAN) **14.** **The percentage formula of pentosans** (SCHORSCH) **10.** **Rotary furnaces for pyrites burning** (DEBUCH) **18.** **Explosion risk in the industrial preparation of absolute alcohol from sulfite spirit** (SCHLUMBERGER) **16.** **New developments with dispersed rubber** (WINKELMANN) **30.** **Drying cylinder for paper, etc.** (Austrian pat.) 109,048) **1.** **Softening and waterproofing cellulose products** (Fr. pat. 635,637) **18.** **Determining and controlling the humidity of paper and cellulose** (Fr. pat. 635,296) **1.** **Photographic films** (Fr. pat. 635,281) **5.** **Use of jets of liquid such as water for detaching cellulosic bodies from their molds** (U. S. pat. 1,687,282) **13.** **Apparatus for drying paper in long lengths** (Brit. pat. 285,378) **1.**

MADDOX, H. A.: **Paper: its history, sources and manufacture.** 2nd edition. London: Sir Isaac Pitman and Sons, Ltd. 3s. Reviewed in *Paper Making* **47**, 169 (1928).

Cellulose. O. C. STRECKER. Brit. 284,846, Jan. 13, 1927. Practically pure cellulose, in high yield, is obtained from materials such as red pine wood, beech wood, bamboo, straw and Scotch fir or other resinous woods by use of boiling solns. contg. hydroxy compds. of the isocyclic series in which at least 1 H atom of the OH group has been replaced by a metal preferably of the alkali, alk. earth or Mg group. Metal derivs. of phenol, cresol, naphthol and their hydrogenated derivs. as substitution products contg. halogens or NO_2 groups may be used and these substances are preferably used in the form of permanent emulsions which may be stabilized by addns. such as castor oil soaps, cyclohexanol and salts of humic acid. Penetration of the vegetable fibers is promoted by addn. of various salts such as Na_3PO_4 or various other substances and catalysts also may be used, of which BaO_2 is given as an example. The boiling may be effected under pressure to expedite the operation and attack on the cellulose fibers, themselves, may be checked by addn. of substances such as Na_2SO_3, Na formate, Na malate, Na phenylsulfonate or their homologs or substitution products, stannous oxide or the like. Metal compds. may be added during the process to replace the metal cation entering into the lye by chem. reaction with acids formed from the vegetable fibers. Numerous details and modifications are given.

Cellulose esters. I. G. FARBENIND. A.-G. Fr. 635,963, June 14, 1927. See Brit. 279,796 (*C. A.* **22**, 3044).

Cellulose esters. I. G. FARBENIND. A.-G. Brit. 284,298, Jan. 27, 1927. Insol. or but slightly sol. cellulose esters of the higher aliphatic acids such as cellulose tristearate, cellulose dipalmitate or cellulose trilaurate, prepd. by reaction between cellulose and an acid chloride in the presence of pyridine, quinoline or similar base, are rendered sol. in usual org. solvents and suitable for manuf. of soft and elastic films, by treating them in a liquid medium and at a high temp. (80–200° according to different examples) with an acid, an acid anhydride or a salt of a strong acid with a feeble base, *e. g.*, with trichloroacetic acid, pyridine hydrochloride, $FeCl_3$, $ZnCl_2$, $AlCl_3$ or benzenemonosulfonic acid. The esters are pptd. in flocculent form by pouring the solns. into MeOH, EtOH or acetone. The treatment is also applicable to cellulose mono-esters of higher aliphatic acids. Cf. *C. A.* **22**, 3988.

Cellulose acetates. HENRY DREYFUS. Can. 283,661, Oct. 2, 1928. Cellulose acetates are produced by preheating cellulosic material with a gas comprising vapors of AcOH and an inert gas such as air and then acetylating the preheated cellulose in the presence of condensing agents in quantity less than 5% on the wt. of the cellulosic material and in the presence of AcOH in quantity 6 times the wt. of the cellulosic material, the acetylation being effected in presence of org. products suitable for the prevention of gelatinization of the cellulose derivs. during acetylation.

Acylation of cellulose. HENRY DREYFUS. Can. 283,660, Oct. 2, 1928. Cellulosic material is treated with vapors of a lower fatty acid (*e. g.*, AcOH) and then air is passed through the material to remove at least a part of the acid.

Plastic composition containing acetylcellulose. GEORGES E. ZELGER (to DuPont-Pathe Film Mfg. Corp.). U. S. 1,685,443, Sept. 25. Acetylcellulose 100 is used with monoethyl diphenyl phosphate 20 parts. U. S. 1,685,444 specifies acetylcellulose together with monoethyl di(monochlorophenyl) phosphate or other suitable phosphoric esters contg. both aliphatic and halogenated aromatic radicals.

Coloring cellulose derivatives. I. G. FARBENIND. A.-G. Brit. 284,999, Feb. 7, 1927. Sol. or insol. inorg. or org. pigment dyes may be mixed with solns. such as those of ethylcellulose or acetylcellulose and these colored solns. then used for printing designs on or for coloring cellulosic films such as those formed of regenerated cellulose from viscose or ammoniacal Cu oxide solns. or films of nitrocellulose, ethylcellulose or the like. Metallic powders also may be used as coloring agents.

Films and other products from emulsified and dissolved cellulose derivatives. I. G. FARBENIND. A.-G. Brit. 285,355, Feb. 12, 1927. Elastic masses, films, coating compns. and other products are prepd. by desiccating emulsions contg. both cellulose derivs. insol. in water but sol. in org. solvents and those that are sol. in water or that swell in water. Suitable water-sol. derivs. are cellulose ethers contg. 1.5–2.5 methoxyl groups, or ethylcelluloses contg. not more than 1.5 ethoxyl groups, or water-sol. hydroxyalkyl cellulose ethers as obtained by the action of an alkylene oxide on cellulose or an alkylene chlorohydrin on soda cellulose. As water-insol. derivs. there may be used

nitrocelluloses, acetylcelluloses and other org. acid esters, and water-insol. cellulose ethers. Numerous details, modifications and examples are given.

Apparatus for making coagulated cellulose films. O. SINDL. Brit. 284,725, Feb. 5, 1927.

Esterifying mercerized cellulose with lower aliphatic acids. HANS T. CLARKE and CARL J. MALM (to Eastman Kodak Co.). U. S. 1,687,059, Oct. 9. Cellulose such as cotton, tissue paper, or bleached sulfite wood pulp is mercerized and then heated with HOAc or other aliphatic acid contg. 2 to 7 C atoms, without a catalyst, at a temp. of 100–170° until the acyl group in the ester thus produced reaches at least 8% (no other acylating agent being used). U. S. 1,687,060 specifies cellulose esters contg. an acyl group with a halogen-substituted chain (the halogen being more than 1% the wt. of the ester), which may be formed by brominating cellulose crotono-stearate or by other reactions and are suitable for making films, etc. Cf. *C. A.* **22**, 2273.

Washing artificial products obtained from cellulose solutions. HERMINGHAUS & CO. G.M.B.H. LEOPOLD HESSE and HERMANN RATHERT. Fr. 635,680, June 7, 1927. Bobbins or rollers of products from cellulose solns. are washed by very small drops of water obtained, *e. g.*, by the use of porous distributors. The water may be transmitted to bobbins below without formation of drops by wires covered with cloth.

"Painting-ground" for artists. C. F. CROSS, VISCOSE DEVELOPMENT CO., LTD., and WINSOR & NEWTON, LTD. Brit. 284,363, Aug. 26, 1926. Blotting paper may be affixed to a cellulose textile backing by means of viscose which completely fills the textile, and the material afterward sized with viscose; or, cellulose pulp may be incorporated with viscose and the mixt. applied to textile material.

Viscose. DU PONT RAYON COMPANY. Fr. 635,408. June 1, 1927. Diagonal protuberances or undulations are made on the surface of sheets of wood pulp used in viscose manuf. to give the caustic liquor, in the setting process, immediate free access to all parts thereof, and thus avoid the formation of brown spots caused by the presence of hemicellulose in already-used liquor. The presence of hemicellulose in the liquor up to 3.5% accelerates the subsequent ripening.

Viscose products. BORVISK SYNDICATE LIMITED. Fr. 636,090, June 17, 1927. A viscose contg. oils or fatty substances such as olive or castor oil or emulsified mineral oils is used for making threads, etc. A hydrogenated hydrocarbon such as tetralin may also be added.

Viscose silk and films. COURTAULDS LIMITED. Fr. 635,294, May 13, 1927. Viscose contg. 1 to 3% of a sol. carbonate is projected into a bath contg. 9 to 11% H_2SO_4, 10 to 14% Na_2SO_4, 8 to 14% $MgSO_4$ and 0 to 8% $ZnSO_4$, the bath contg. 25 to 28% of total sulfates.

Artificial textiles. NAAMLOOZE VENNOOTSCHAP NEDERLANDSCHE KUNSTZIJDEFABRIEK. Fr. 635,195, May 30, 1927. Textiles having a dull appearance are made from viscose to which has been added during the manuf. a sulfide, sulfite, thiosulfate, polysulfide or other compd. liberating S. The product is treated in the usual way but the S is retained in the textiles.

Artificial silk. G. BONWITT. Brit. 285,066, Feb. 11, 1927. Threads with a "reduced luster" are obtained from viscose by emulsifying with the latter substances such as mono- and di-chlorobenzenes, xylene and hydrogenated naphthalenes or their mixts. which preferably have about the same sp. gr. as the viscose to be spun.

Artificial silk. WILLIAM P. DREAPER. Can. 283,659, Oct. 2, 1928. Artificial filaments and yarns in imitation of "gum type" silk are produced by treating the freshly pptd. gel filaments produced from viscose solns. before they are dried in a state of tension with a desulfurizing soln. to which there is added NaCl in amt. substantially 80% of the satn. value at atm. temp.

Artificial silk. JAMES M. LEAVER (to Pacific Lumber Co.). U. S. 1,685,640, Sept. 25. Soln. producing artificial silk is discharged downwardly in a plurality of streams which are permitted to fall through the air to reduce their diam. and the falling streams are brought into contact with a moving sheet of setting soln. having a surface speed approx. the same as that of the falling streams at their point of contact with the sheet. An app. is described.

Artificial silk. I. G. FARBENIND. A.-G. Fr. 635,774, June 10, 1927. The pptg. agents for artificial silk contain CO_2 or bicarbonates.

Filter for solutions used in manufacture of artificial silk. WM. P. DREAPER. U. S. 1,685,775, Oct. 2. Structural features.

Artificial threads. CHEMISCHE FABRIK VORM. SANDOZ. Fr. 635,304, May 21, 1927. Vegetable fibers are acetylated by a mixt. of Ac_2O, AcOH and a catalyst, the acetylation being pushed only to the mono- or diacetate, with catalysts formerly used

for making the triacetate. Examples are given in which H_2SO_4 and $ZnCl_2$ are used as catalysts.

Apparatus (with reciprocating troughs for freshly spun threads) for making artificial silk. HOLKENSEIDE GES (to J. P. Bemberg A.-G.). Brit. 284,618, Feb. 1, 1927.

Apparatus for spinning artificial silk. C. HAMEL A.-G. Brit. 284,986, Feb. 7, 1927.

Apparatus for spinning artificial silk. H. KINDERMANN. Brit. 285,587, Nov. 23, 1926. Structural features.

Centrifugal spinning box for spinning artificial silk. F. BEIER (to Bergmann Elektricitats-Werke A.-G.). Brit. 285,011, Feb. 8, 1927.

Tower construction for making bisulfite liquor. JACOB D. JENSSEN (to G. D. Jenssen Co.). U. S. 1,684,494, Sept. 18. A valve-system construction and other structural details are specified.

Regeneration of black liquor. ALFRED H. WHITE (to John E. Alexander and Edward G. Goodell, Trustees for Falls Mfg. Co., The Wausau Sulphate Fibre Co., The Nekoosa-Edward Paper Co. and Stevens Point Pulp and Paper Co.). Can. 283,820, Oct. 2, 1928. Black liquors from the sulfate pulp process are regenerated by concg., adding sufficient burned CaO to raise the temp. to distil destructively the org. constituents of the black liquor, raising the temp. of the residual mixt. to above the min. required to reduce Na_2SO_4 in the presence of CaO and below the temp. at which $CaCO_3$ dissociates and lixiviating the product. Cf. *C. A.* **22**, 4247.

Treating sulfite wood pulp liquor. WEBSTER E. BYRON BAKER. U. S. 1,685,800, Oct. 2. In order to recover sulfite material useful in prepg. sulfite cooking liquor, the waste liquor is neutralized with an alk. earth metal base such as lime to give a p_H of 9 or a greater alky. and to decomp. the reversibly combined SO_2 and increase the recovery of S as monosulfite; in prepg. the cooking liquor, the solids are treated with cooking acid contg. free SO_2 for producing bisulfites.

Apparatus (with a perforated rotating drum) for separating liquid from pulp fibers. JOHN H. HOYT (to United Filters Corp.). U. S. 1,685,084, Sept. 25.

Fertilizer from sulfite waste lye. MAX P. NITSCHE. U. S. 1,684,712, Sept. 18. See Can. 271,893 (*C. A.* **21**, 3743). Waste liquor obtained in the manuf. of sulfite cellulose is treated with an acid sulfate such as $KHSO_4$ and subjected to evapn. by which SO_2 is removed and a residue obtained that is suitable for use as a fertilizer.

Recovering sulfur dioxide from waste gases. GEORGE A. RICHTER (to Brown Co.). U. S. 1,685,754, Sept. 25. The hot digested contents of a sulfite digester are discharged into a blowpit, hot SO_2 and vapors liberated in the blowpit are passed in direct contact with and in counterflow to cold water supplied in such regulated amt. that the largest fraction of SO_2 is cooled without being absorbed and passes on in a cooled condition for absorption; some SO_2 is also recovered from the hot effluent water. Cf. *C. A.* **22**, 4247.

Digestion of crude materials for the manufacture of paper and other applications. SAMUEL MILNE. Fr. 635,307, May 23, 1927. Chem. processes for purifying cellulose for the manuf. of paper are intensified by a treatment with oscillating elec. currents.

Digesting wood chips. ROBERT WOODHEAD (to Venning D. Simons). U. S. 1,687,076, Oct. 9. In the manuf. of wood paper pulp by the use of liquors such as those of the "soda" or "sulfate" process wood chips are preheated in the presence of previously used digesting liquor to which a small quantity of fresh digesting liquor has been added, this liquor is drawn off and the material is then subjected to a final cooking with fresh liquor.

Pulp for paper making from wood or other materials. S. D. WELLS. Brit. 285,277, April 20, 1927. The material, preferably after suitable digestion, is disintegrated by the rolling action of rods in a "rod mill." "Gum chips" may be digested with 10% of Na_2SO_3 and 4% Na_2CO_3 or $NaHCO_3$; for pine wood 8% NaOH and 1% S, and for tamarack 8% of $Ca(HSO_3)_2$ and 2% of SO_2 (based on the wt. of the wood) are suitable. Straw, grass, bamboo, cornstalks, bagasse and other materials may also be softened, disintegrated or digested in the rod mill.

Paper-making apparatus. CHARLES L. HENDERSON (to Paper Patents Co.). U. S. 1,686,322, Oct. 2. A pulp strainer is described.

Pulping "engine" for treating paper pulp, etc. L. A. BARRY and L. A. BARRY. Brit. 284,992, Feb. 7, 1927.

"Beating engine" for treating paper pulp. HERBERT R. SIMONDS (to A. A. Simonds-Dayton Co.). U. S. 1,684,521, Sept. 18. Structural features.

Apparatus for screening paper pulp, etc. HAROLD D. WELLS. U. S. 1,685,736, Sept. 25.

Apparatus for screening paper pulp, etc. EDWARD B. FRITZ. U. S. 1,685,809, Oct. 2.

Control device for pulp refining "engines." ARTHUR J. LOMAN (one-half to Wm. Brown). U. S. 1,686,217, Oct. 2.

Regulating the flow of fibrous stock in paper making and similar processes. JAMES A. HEDGCOCK (to Management Engineering and Development Co.). U. S. 1,687,446, Oct. 9. Mech. features.

Controlling the flow of stock on paper-making apparatus. RALPH E. HEISEL (to Mead Pulp & Paper Co.). U. S. 1,687,447, Oct. 9. Mech. features.

Thickness regulator for paper-making apparatus. P. OFFENHEIMER, S. BLOCK and E. OFFENHEIMER (trading as Cellulosefabrik Okriftel a.M. Offenheimer). Brit. 285,311, Nov. 15, 1926.

Apparatus for making paper and spraying waterproofing material on it during manufacture. LESTER KIRSCHBRAUN. U. S. 1,686,818, Oct. 9.

Apparatus (with heated cylinders) for drying paper. WM. A. LORENZ (to Otaka Fabric Co.). U. S. 1,685,427.

Drying paper board as manufactured. R. KASTNER and H. SCHMOLKA. Brit. 284,319, Jan. 29, 1927. Paper board as it comes from a paper-board machine or other materials such as leather, veneers or fibrous intermediate products of the paper industry are pressed in piled sheets and then heated (suitably to about 70°) and further pressed to remove addnl. water and the heating is continued until the mass contains about 70% of paper substance. The temp. is then raised to 100-110° and the pressure reduced to allow the steam to escape, then increased and reduced alternately until the product reaches an air-dry condition. An app. and various mech. details are described.

Sizing paper. LOUIS-FERNAND-CHARLES GIRARDET. Fr. 635,419, June 2, 1927. The surface of paper is rendered more capable of absorbing the colloidal resin by adding an electrolyte such as $Al_2(SO_4)_3$. A colloidal soln. of resin is obtained by passing NaOH or Na_2CO_3 through it.

Coating paper or the like with bituminous substances. NAAMLOOZE VENNOOTSCHAP DE BATAAFSCHE PETROLEUM MAATSCHAPPIJ. Fr. 635,968, June 14, 1927. Paper pulp is mixed with a gel of asphalt or other bituminous substance till 1 to 2 times the wt. of the paper pulp is absorbed. Waterproofing materials may be added. The gel is prepd. as described in Fr. 614,819.

Insulating paper. FELTON & GUILLEAUME CARLSWERK A.-G. Fr. 635,236, May 30, 1927. Colloidal cellulose pptd. by electrolytes, is used alone or with fibrous material for the manuf. of insulating paper. Cf. *C. A.* **22**, 3530.

Crinkled paper. WM. A. LORENZ (to Otaka Fabric Co.). U. S. 1,686,388, Oct. 2. In order to make paper elastic in all directions, a wet paper web is crinkled laterally, and longitudinally extending grooves are formed in the crinkled paper while it is still wet. An app. is described.

Colored paper. THOMAS HANS (to Container Corporation of America). U. S. 1,685,917, Oct. 2. In making paper from fluid, fibrous pulp, the pulp is incorporated with a part only of the coloring matter and sizing to be used, and after drying the advancing paper sheet, but before calendering, its surface is treated with a thin liquid contg. colored, paraffin-treated tapioca flour. An app. is described.

Washable colored paper. A. SANDERSON & SONS, LTD., AND H. A. SIMS. Brit. 284,435, Dec. 10, 1926. Wallpaper or other paper having a printed colored pattern is rendered washable by treating it with a dil. soln. of nitrocellulose contg. little or no gum or other gloss-producing agent. Several formulas of solns. are given.

Watermarked paper. ANTON PLEYER (to Gebr. Ebart). U. S. 1,687,140, Oct. 9. A body consisting of long fibers carries a deposited layer of short fiber material deposited as loose pulp upon a portion only of the body while the latter is still in pulpy condition; the fibers of the body and deposited layer are intimately interlocked and the short fiber layer merges into the main body of the material along an irregular line visible on the surface.

24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNROE

Explosives and their properties. I. GRAGEROFF. *Mining Congress J.* **14**, 715-6, 789(1928).—See *C. A.* **22**, 3530. E. M. SYMMES

Weight and density of explosives. F. MOUTHS. *Z. ges. Schiess-Sprengstoffw.* **23**, 80-1(1928).—The article explains the terms specific density, cubic density, loading

density and energy density as applied to explosives, and their relation to each other.
C. G. STORM

Report of Chief Inspector of Explosives of Victoria for 1927. REG. J. LEWIS. *Pamphlet* 10 pp.(1928).—No accident occurred during the year in manuf., storage, or transportation of the upwards of 9,000,000 lbs. of explosives and 10,000,000 detonators manufd. or imported. Of the recorded accidents in use, 4 occurred in loading gelignite and one in loading racka-rock into boreholes because of too high pressure put on the tamping rods. A number of accidents to children from playing with explosives, and especially detonators, are reported. CHARLES E. MUNROE

Smokeless powder. CYRIL KRAUZ. *Chemický Obzor* **1**, 2–9, 52–9, 127–31, 237–42, 267–70, 298–302; *Chem. Zentr.* **1927**, II, 2139.—A discussion of the phys. and chem. properties, *e. g.*, the shattering power, energy content, influence of the particle size and shape, with a description of the principles involved in the manuf. C. C. D.

Results obtained with pellet powder. B. L. LUBELSKY. *Coal Mining* **5**, 216–8 (1928).—Pellet powder produces much less smoke than granular black powder, allows quicker return to the face, reduces the slack coal produced from 33 to 30.5%, and reduces the consumption of powder. E. M. SYMMES

Production of trinitrotoluene in Austria during the World War. R. POLLER. *Z. Farben-Ind.* **20**, 127–31, 173–6(1928).—Details are given of the process for mfg. this explosive, used in Austria during the war. FREDERICK C. HAHN

The sodium salt of hydrazoic acid. EBERHARD KAYSER. *Z. angew. Chem.* **41**, 49(1928).—Tablets of NaN_3 about 0.005–0.010 g. in wt. when tested by the falling hammer method proved suitable for use in certain (safety) explosives. Such a tablet did not have a marked salty taste, but when one was swallowed there ensued within 5 min. violent heart stimulation, throbbing at the base of the brain, then loss of consciousness for 10 min., and rapid recovery. Less severe attacks recurred during the following hour. Symptoms were said to be similar to those caused by strychnine.
W. C. EBAUGH

Volumetric determination of diphenylamine and the centralites in smokeless gunpowder. OLDŘICH TUREK. *Chemický Obzor* **1**, 295–8; *Chem. Zentr.* **1927**, II, 999.—Ph_2NH is detd. by extg. it from smokeless gunpowder with Et_2O or distg. it with H_2O vapor. With the aid of an accurately standardized soln. of 8.35 g. of dry $KBrO_3$ and 30 g. KBr in 1 l. of distd. H_2O, Ph_2NH in a soln. contg. HCl is transformed into $(Br_2C_6H_3)_2NH$. The excess of Br is titrated back iodometrically. In the same manner, centralite I = $(C_2H_5)_2NCON(C_6H_5)_2$ is estd. The bromination is not quite so easy, but with exptl. conditions kept const., dibromocentralite is obtained in a reproducible way. The same method is used for detg. centralite II = $(CH_3)_2NCON(C_6H_5)_2$.
G. SCHWOCH

The Trauzl (lead block) test. R. NEUBNER. *Z. ges. Schiess-Sprengstoffw.* **23**, 1–5, 53–6, 72–7, 125–9, 194–8(1928).—Results obtained by the usual method of the Trauzl Pb-block test for *explosives* are not comparable. Instead of measuring the expansion produced by a standard wt. of explosive, N. dets. the wt. of explosive required to produce a standard expansion of 300 cc. The main variable thus eliminated is the gradual weakening of the walls of the Pb block with increasing expansion of the cavity. Corrections for (1) the original vol. of the cavity, (2) the expansion produced by the detonator, (3) the effect of the tin-foil wrapper, etc., are also eliminated. For purposes of comparison, the expansion value (in cc.) of 10 g. of the explosive may be calcd. from the 300 cc. value, and is designated as the strength number (Kraftzahl or "KZ"). The KZ values of explosive components of a mixt. are additive. KZ values for non-explosive components can be detd. by making Trauzl tests of their mixts. with "neutral" explosives such as glycol dinitrate, which give non-reactive products of explosion. Such KZ values are useful in formulating new explosive mixts. and predicting their properties. Old Trauzl values may be converted into new KZ values by a simple method of calcn. which is described. Purity of the Pb of the block is an important factor, variations in purity causing differences in expansion as great as 80 cc. The relations of the characteristic properties of explosives to their Trauzl block KZ values are discussed at length. In all explosion reactions N. assumes that CO is produced only by secondary reactions and not as a primary product, and that all products, including C, are gaseous at the instant of explosion. A method of calcg. *velocities of detonation* of explosives on the basis of KZ values is described. C. G. STORM

Testing the accuracy of measurement of the spark chronograph for determining the velocity of detonation (of explosives). H. KAST AND H. SELLE. Chem. Tech. Reichsanstalt. *Z. ges. Schiess-Sprengstoffw.* **23**, 217–9(1928).—A series of 36 measurements of the velocity of detonation of $Hg(ONC)_2$ *detonating fuse* were made with 1-m.

and 3-m. lengths of fuse with corresponding drum speeds of 70 and 210 r.p.sec., resp. The close agreement of results under such differing conditions demonstrated the high degree of accuracy of the Hartmann-Kempff frequency meter used. The mean error of all detns. was only 26 m./sec., with a mean velocity of 5251 m./sec. The error due to elec. disturbances is about 5 times the error of reading. Excellent agreement was also obtained in tests of pentaerythritol tetranitrate detonating fuse and other initiating explosives, whereas less uniformity was obtained with TNT fuse, gelatin dynamites and other explosives. This is attributed to differences in ease of detonation of the explosives. C. G. STORM

Tests with explosive gas mixtures. PAUL H. PRAUSNITZ. *Z. angew. Chem.* **41,** 1066–9(1928).—To protect against gas explosions where no destruction of the tube is to be feared and where there is no development of a red heat of the porous plate or screen the quartz filter tube (100 to 35μ diam. of pores) far exceeds the Fresenius tube with a wire screen. The degree of protection depends directly upon pore diam. For less brisant gases (illuminating gas-air mixts.) a glass filter with large pores suffices. The use of such tubes should facilitate the study of ignition of explosive gas-air mixts. and phenomena of surface combustion. E. M. SYMMES

Coal dust explosions. HANS STEINBRECHER. Braunkohlenforschungsinst., Freiburg (Sa.). *Braunkohlenarch.* **1927,** No. 17, 1–13; *Chem. Zentr.* **1927,** II, 1638; cf. *C. A.* 22, 500.—With the object of showing the cautions to be taken in preventing coal dust explosions, a comprehensive survey is made of the phenomena of such explosions, reference being made in particular to the great influence of the ignition point and distn. temp. upon the explosive power of various kinds of coal dust, especially brown coals. In contrast to gas, dust is not composed of mols. but of mol. aggregates, and it is therefore in a colloidally dispersed state and possesses all the characteristic properties of a reversible colloid. Its ability to oxidize increases greatly with increase in its fineness. The *ignition point and the time of ignition* (from the ignition point and from 200°) *of peat and various brown coals and mineral coals,* the *lower explosive limits,* the *volatile components,* the *H content,* the *combustible gases in the distd. gas,* the *ash of the dry coals,* the *distn. temp. and the bitumen content* were detd. Evaluation of the data shows in a convincing manner the *influence of the ignition point and distn. temp. on the explosive capacity.* C. C. DAVIS

Spontaneous electrification of dust clouds. S. C. BLACKTIN. Safety in Mines Research Board (London), *Paper* No. **43,** 3–19(1928).—This is a preliminary paper in which it is recorded that electricity is generated in coal dust clouds raised by a current of air, the quantity generated increasing with the speed of the air current and wt. of dust used, but varying with the sample of coal dust used. Sparks may be obtained from the charges so generated. In quant. expts. emery dust was used to sep. the coal dust particles, the latter tending by themselves to agglomerate. Expts. with *lycopodium* spores and with rice and potato starches indicates that the electricity generated per unit wt. of material passed increases with decrease in particle size, *i. e.,* this charge increases either with increase of surface area exposed, or with increase of number of particles. This relationship has been confirmed for coals by showing that increase in particle fineness, due to grinding, results in increase of elec. charge. C. E. M.

Explosibility of sulfide dusts in metal mines. E. D. GARDNER AND EDMUND STEIN. *Bur. Mines, Repts. Investigations* No. **2863,** 11 pp.(1928).—Explosions have occurred in blasting in massive sulfide ores of greater magnitude than could be accounted for by the charge of explosive used in making the blast. During regular blasting in such ores sulfide dust is produced and scattered about the mine, while SO_2 and H_2S appear in the atm. In these occasional heavy blasts the concns. of SO_2 in the afteratm. is very high. Gallery tests show that sulfide dusts can be ignited by blasting and that the combustion may be violent enough to be considered an explosion but it was not shown if such explosions are self-propagating. To prevent these explosions, settled dust should not be allowed to accumulate. All working places should be thoroughly wetted by sprinkling before the bore holes are loaded. And bore holes should be steamed and tamped to the collar. CHARLES E. MUNROE

Gaseous explosions. VI. Flame and pressure propagation. J. V. HUNN AND GEORGE G. BROWN. *Ind. Eng. Chem.* **20,** 1032–40(1928).—A cylindrical, steel bomb contained a window, 6 pressure elements along its length, and a spark plug at one end. Explosive gas mixts. were ignited in it, and flame and pressure curves registered automatically. As flame propagates a pressure wave is set up in the mixt. behind the flame front and travels at a greater velocity than the flame front. The pressure in the crest of this wave behind the flame front is greater than the pressure in the flame front of the unignited mixt. ahead of the flame. The halt and recession of the flame front is

caused by the pressure wave which follows the flame front at a greater velocity, overtaking and passing through the flame front. The max. pressure in mixts. promoting after-burning is developed some time after total inflammation of the charge.
E. M. SYMMES

The "normal" propagation of flame in gaseous mixtures. WILLIAM PAYMAN. *Ind. Eng. Chem.* 20, 1026–32(1928).—A preliminary attempt to trace the relation, if any, between speeds of flame in mixts. of air with H_2, CO, CH_4 and other paraffin hydrocarbons, C_2H_4 and C_2H_2, ignited under different conditions. The work is being continued and greater attention given to exceptions to these relationships.
E. M. SYMMES

The gaseous explosive reaction at constant pressure. F. W. STEVENS. *Ind. Eng. Chem.* 20, 1018–26(1928).—The course of the gaseous explosive reaction at const. pressure is described and followed by photographic time-vol. records in a transparent bomb. At const. pressure uniform rate of propagation, *s*, of the explosive reaction zone, measured relative to the active gases, is proportional to the product of their concns. (partial pressures): $s = k_1[A]^{n_1}[B]^{n_2}[C]^{n_3}\ldots$. The effect of inert gases and of composite fuels on the rate of gaseous explosive transformation is shown. E. M. S.

Warning when working with ether. HEINRICH DEMUS. *Z. angew. Chem.* 41, 426 (1928).—D. reports an explosion that happened while he was evapg. ether on a water bath. He thinks the explosion was caused by ether peroxide, which he found to be present in the ether employed. To remove the peroxide the ether is allowed to stand over an acid soln. of $FeSO_4$, from which it is distd. before use. In evapg. the ether, D. obtained a small amt. of an oily residue which smelled like stonecrop, and supposedly was ether oxide.
G. SCHWOCH

Self-ignition of oiled wool (OESTERMANN) 25. Spirit for combating celluloid fires (HAUCK) 23. Prevention of danger in the operation of gas generators (KATTENTIDT) 21. Explosion risk in the industrial preparation of absolute alcohol from sulfite spirit (SCHLUMBERGER) 16. Graphical evaluation of nitrating acids (BENDA) 23. The explosive properties of solid hypochlorite (WEICHHERZ) 18. The explosions occurring at the transferring of tar, tar oils and pitch by compressed air, their supposed causes and their prevention (LEYMANN) 21. Accidents in the production of Pb bromate (WITT) 18. Diethylene glycol dinitrate (U. S. pat. 1,686,344) 10. Treating tar [for making explosives] (Brit. pat. 285,000) 21. Combined carbide can and water receptacle suitable for refilling miners lamps (U. S. pat. 1,684,996) 1.

Explosive. N. F. ZHIROV. Russ. 4283, Dec. 31, 1927. Tetryl 100 parts and NH_4ClO_4 150 parts are moistened with a mixt. of AmOH and acetone, ground and dried.

Explosive. N. F. ZHIROV. Russ. 4284, Dec. 31, 1927. One hundred parts by weight of tetryl is mixed with 120 parts of $KClO_4$.

Explosives. REMINGTON ARMS CO. Brit. 285,232, Jan. 24, 1927. A priming mixt. without chlorate is formed with Hg fulminate, oxidizing salts such as $Ba(NO_3)_2$ and Pb nitrate, Pb thiocyanate and may contain Sb sulfide, other reducing agents, ground glass and a gum or gelatin glue.

Cyano nitrate explosives. FRANK H. BERGEIM (to E. I. duPont de Nemours & Co.). U. S. 1,685,771, Oct. 2. Explosives are prepd. contg. a cyano and a nitro group, *e. g.*, a dynamite may comprise cyano-ethanol nitrate 15, nitroglycerin 15, $NaNO_3$ 58, wood meal 11 and chalk 1%.

Dynamite. NORMAN G. JOHNSON and SAMUEL G. BAKER, JR. (to E. I. DuPont de Nemours & Co.). U. S. 1,687,023, Oct. 9. Ground popped corn is used for producing dynamite of low density, which, *e. g.*, may be formed with nitroglycerin, NH_4NO_3 and $NaNO_3$ also.

Gelatin dynamite. KENNETH R. BROWN (to Atlas Powder Co.). U. S. 1,686,952, Oct. 9. A nitroglycol such as ethylene glycol dinitrate is used to promote gelatinization in making explosives contg. nitrocellulose, nitroglycerin and a nitrated sugar.

Baffle plate apparatus for separating nitroglycerin or nitroglycol, etc., from residual acids used in their manufacture. A. SCHMID and J. MEISSNER (from Dynamit-A.-G. vorm. A. Nobel & Co.). Brit. 284,701, Feb. 5, 1927.

Nitrating glycerol and similar alcohols. A. SCHMID and J. MEISSNER (from Dynamit-A.-G. vorm. A. Nobel & Co.). Brit. 284,700, Feb. 5, 1927. An app. is described into the upper part of which glycerol, glycol or other material to be nitrated is introduced while nitrating acid is introduced into the lower part of the closed ni-

trating vessel which is provided with cooling coils and a stirrer. Brit. 284,702 specifies a column app. for washing nitrated products with soda soln. which may be agitated with compressed air or stirring devices.

25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

Estimation of Katanol O(By) and investigation of its absorption by viscose silk. P. E. KING, G. M. WADADEKAR AND E. N. JOHNSON. *J. Soc. Dyers Colourists* **44**, 237–41(1928).—An aq. soln. contg. 1 g. of katanol O and 0.2 g. Na_2CO_3 was made up to 500 cc. To 10 cc. of this soln. was added 5 cc. of concd. H_2SO_4 and 100 cc. of water. The Katanol O was thereby pptd. and remained in suspension. This suspension was heated to 70° and was titrated with 0.1 *N* permanganate soln., *adding only 0.5 cc. at a time* and shaking until the color disappears. One cc. of 0.1 *N* permanganate is equiv. to 0.001156 g. of Katanol O. The absorption of Katanol O by viscose silk during 30, 60, 90 and 120 min. periods was 1.53, 1.81, 2.05 and 2.14%, resp. on the wt. of the silk. Up to 10% concn. of Katanol O the absorption by viscose silk varied directly as the concn. At concns. of Katanol O above 10% the absorption increased but not so rapidly. At temps. of 100, 85.70 and 60° for entering the viscose, the Katanol O absorbed was 2.26, 1.99, 1.69 and 1.62%, resp. Concn. of the bath increases the amt. of Katanol O absorbed. Increasing the concn. of Na_2SO_4 increased the percentage of Katanol O absorbed. Increasing the concn. of Na_2CO_3 decreased the percentage of Katanol O absorbed. In the titration of Katanol O soln. it was finally suggested to add the H_2SO_4 in a dild form so that the vol. of the liquor to be titrated shall be 300 cc. and the titration be commenced cold. Only toward the end of the titration was the temp. raised to 70°. L. W. RIGGS

The spectra of dyes. P. LAZAREV. *Chimie et industrie* Special No., 457–9(April, 1928).—An atlas has been prepd. of about 750 spectra, which were measured with a König-Martens spectrophotometer, the results being given in tabular and graphic form. The method used in making the detns. is described. A. PAPINEAU-COUTURE

Application of the T. C. B. photo-colorimeter to the determination of the strength of dyes. G. MARTIN. *Chimie et industrie* Special No., 460–5(April, 1928); cf. Toussaint, *C. A.* **21**, 3492.—A detailed description of the method of using the instrument for detg. the strength of dyes. A. PAPINEAU-COUTURE

The problem of color. F. RUDOLF. *Chimie et industrie* Special No., 454–6(April, 1928).—A criticism of Ostwald's color circle. A symmetrical color circle is suggested based on the polar diagram of the spectrum using a logarithmic formula such as (log. max. − log. min.)/(log. mean − log. min.) = C, in which C = 100/0, 100/25, 100/50, 100/75, 100/100, etc., for tones 1 (λ = 630), 2, 3, 4, 5, etc. The advantages and method of using this scale are discussed. A. PAPINEAU-COUTURE

Color purity and its measurement. L. BLIN DESBLEDS. *Textile Colorist* **50**, 170–2 (1928).—Color purity is discussed from the standpoint of the dyer. C. E. M.

Determination of light-fastness of dyes. E. TREPKA. *Przemysl Chem.* **12**, 249–52 (1928).—T. disagrees with Kaczkowski (cf. *C. A.* **22**, 2842) concerning K.'s estimate of value of artificial light for evaluating fastness of dyes. A. C. ZACHLIN

Fastness of dyes to light. W. KACZKOWSKI. Polytech., Warsaw. *Przemysl Chem.* **12**, 463–5(1928).—Reply to Trepka (cf. preceding abstr.) A. C. Z.

The behavior of dyestuff solutions. L. BLIN DESBLEDS. *Cotton* **92**, 299–303 (1928).—Optical analysis of dyestuffs is useful to the dyer in the prepn. of the dye bath and in explaining unexpected results of a mixt. of colors. An optical analysis of litmus in water soln., carried out by the Toussaint (T. C. B.) photo-colorimeter shows that red is the predominating color at all concns. Starting with water as reference, the curves exhibit increasing distortion with increase in concn. until a max. is reached at a concn. of 0.5 g. litmus in 100 g. H_2O examd. in transmitted light through a 4-mm. thickness of liquid. After the max., the curves tend gradually to flatten, keeping a high peak in the predominating (red) color and a low peak in the complementary (green) color. This behavior is not peculiar to litmus, but applies generally, similar curves being shown for violet diazol. The purity of a dyestuff is defined as the intensity difference between its predominating and its complementary colorations. The apparent purity of a dyestuff varies with its concn.; it passes through a maximum, which always corresponds to the same intensity of its predominating coloration. RUBY K. WORNER

Relation of p_H control to the dyehouse. HAROLD SCHROEDER. *Cotton* **92**, 799–800, 803(1928); *Dyer, Calico Printer* **60**, 49, 79(1928).—Descriptive. R. K. W.

Indigo sols. JAROMIR FRANĚK. *Chemický Obzor* **2**, 133–6; *Chem. Zentr.* **1927**, II, 1903.—Various methods for using indigo sols (sulfo esters of vat dyes) in the *dyeing of wool and cotton* are discussed, with the inclusion of some exact tech. directions for various methods of dyeing. C. C. DAVIS

The application of Indigosol O by the nitrite process. CHAS. E. MULLIN. *Rayon J.* **2**, No. 9, 13–5, 39–41(1927); *Textile J. of Australia* **3**, 140–4(1928).—The various processes and formulas proposed for the application of Indigosol O to cotton and rayon by the nitrite process, with a discussion of the exhaustion of the impregnating bath. CHAS. E. MULLIN

Loss of indigo in the vat. M. CHILIKIN. *Melliand Textilber.* **9**, 318–20(1928).—It has been known that the return of indigo from the vat is less than the amount of indigo originally dissolved. Part of the loss has been charged to oxidation brought about by H_2O_2, which possibly is formed when $Na_2S_2O_4$ decomposes in soln. Whether or not H_2O_2 is so formed, it is certainly formed when indigo white is oxidized in air. In fact quant. estn. is possible based on the reaction: $PbO_2 + H_2O_2 = PbO + H_2O + O_2$. The more alk. the vat the greater the loss of indigo. Since thioindigo shows a similar loss it is believed that amino N is not concerned in the reaction. Isatin was formed by the treatment of indigo white with H_2O_2. E. R. CLARK

Chrome yellow and orange removal on vat indigo blue. N. WOSNESSENSKY. *Bull. soc. ind. Mulhouse* **94**, 469–71(1928); cf. *C. A.* **22**, 3782. Sealed Note 1916 of July 20, 1905.—*p*-Nitro-*o*-anisidine red can be obtained on indigo blue by printing with the nitrosoamine on the fabric which has been prepd. with an org. acid. A reddish yellow can be similarly obtained with nitrosoamine J (take dichloroaniline (Farbw.) 16, hot water 40, 10° HCl 50, ice 36, $NaNO_2$ 8, and slowly add to 38° NaOH 450, 25% HCl 150, which has previously been cooled to 0°); and an orange-red can be obtained with a diazodianisidine, while chloroanisidine-nitrosoamine similarly gives a bright orange. **Chrome-brown removal on vat indigo blue.** *Ibid* 471–2. Sealed Note 1917 of July 20, 1905.—This is obtained by means of nitroso-β-naphthol as follows: print the unprepd. fabric with the following paste: nitroso-β-naphthol 200–400, soln. contg. 100 parts of neutralized $Na_2Cr_2O_7$ thickened with roasted starch 700–500, 23° Cr nitroacetate 100, steam 2 min., pass through a H_2SO_4-$C_2H_2O_4$ bath. By using Fe, Co, etc., salts, khaki, orange-red, deep olive, etc., shades can be obtained. **Report.** PIERRE BINDER. *Ibid* 472–3.—No anteriority was found, and no subsequent mention in the textile literature. The process described in Note 1917 considerably weakens the printed portions of the fabric through the attack of the fibers by the chromate during steaming. The use of the Indigosols has solved the problem of color removals on indigo in a simpler and more complete manner. A. PAPINEAU-COUTURE

β-Naphthol. A. BUNTROCK. *Z. Farben-Ind.* **20**, 3–5, 78–9, 126–7, 176–7(1928).—Details are given for equipment and for conditions of manuf. of β-naphthol, according to the latest developments in connection with this intermediate, based on a plant producing 1,000,000 kg. per year. This series of articles is being continued. F. C. H.

Azo-triphenylmethane and azo-pyronine dyes (meta series). RAJENDRA NATH SEN AND BENOYBHUSHAN GHOSH. *J. Indian Chem. Soc.* **5**, 487–96(1928).—A series of meta azo-aldehydes is coupled with (i) dimethylaniline and with *o*-cresotinic acid to give *azo-triphenylcarbinol dyes* and (ii) with resorcinol, pyrogallol and diethyl-*m*-aminophenol to give *azo-pyronine dyes*. Dimethylaniline gives greenish dyes on wool and silk, *o*-cresotinic acid reddish orange dyes, resorcinol brownish red and red, pyrogallol grayish black and diethyl-*m*-aminophenol violet or bluish violet dyes. The azo-aldehydes used are: *benzeneazosalicylaldehyde*, m. 127°; *naphthaleneazosalicylaldehyde, phenylhydrazone*, m. 96°, *oxime*, m. 201°; *diphenyldisazosalicylic acid-salicylic aldehyde* from diazotized benzidine, salicylic acid and salicylic aldehyde, oxime, m. above 300°; and *diphenyldisazobissalicylaldehyde, dioxime*, m. above 300°. P. J. C.

Dyes for viscose rayon—use of even-dyeing colors for special effects. WESTFORD. *Textile World* **74**, 1612–4(1928).—A table of most suitable dyes is included. R. K. W.

Accurate testing of dyed silks for fastness to perspiration presents many difficulties. FRED. GROVE-PALMER. *Textile World* **74**, 1671–3(1928).—Psychological and physiological factors interfere with the satisfactory testing of dyed silks for fastness to perspiration by actual association with the human body. Of the four laboratory tests adopted by research associations in America and Europe, that of the American Association of Textile Chemists and Colorists appears to approximate most nearly the actual conditions of perspiration. Although results of this test showed a marked similarity to those conducted by persons wearing the dyed fabrics, individual differences in the character of perspiration must still come into consideration. RUBY K. WORNER

Naphthol AS for wool and silk. J. RATH. *Melliand Textilber.* **9**, 595–6(1928).—

By use of low temp. and min. immersion, Naphthol AS may be successfully applied to wool or silk in spite of the alkalinity of the soln. The resultant dyeings produced by coupling show excellent fastness. E. R. CLARK

The physics and chemistry of dyeing. V. The structure of cellulose and substantive dyeing. KURT HESS. *Melliand Textilber.* 9, 573–5(1928).—The affinity of cellulose fibers for substantive dyes seems to be based on residual valences of OH groups disposed peripherally to the cellulose crystallite. As a number of these are required for fixation, only large mols. are suited to substantive dyeing, as has been observed. The effects of treatments of fibers which involve alteration of the form or internal arrangement of the cellulose crystallite are explainable by alteration in the concn. of available secondary valences. E. R. CLARK

Some practical dyeing methods. WILHELM SIEBER. *Melliand Textilber.* 9, 579–80 (1928).—For clearing the whites of alizarin red prints, "dry-chemicking" is recommended. For the purpose a bleaching powder soln. is treated with an excess of Na_2HPO_4. This is applied to the back of the goods, which are then quickly passed over well-wrapped dry-cans, and then washed. The whites of aniline black prints may be cleared with $KMnO_4$ E. R. CLARK

Dyeing silk with the alizarin dyestuffs. F. T. SYKES. *Dyer, Calico Printer* 60, 76–7, 96–7(1928).—The chief mordants used with alizarin dyestuffs on silk are alumina, iron and chrome. Details of the boiling-off, mordanting, dyeing and finishing processes are given. RUBY K. WORNER

Batik dyeing. JAROMÍR FRANĚK. *Chem. Obzor* 1, 189–94; *Chem. Zentr.* 1927, II, 1398.—Information is given concerning the method of batik dyeing and the raw materials and dyes suited for the different purposes. G. SCHWOCH

Dyeing cotton pile fabric. THOMAS J. NUCKOLLS. *Textile World* 74, 1675–7 (1928).—Descriptive. RUBY K. WORNER

Light pinks and mode shades on cotton. JAMES STAPLE. *Textile Colorist* 50, 252 (1928).—The Erban-Specht method is recommended for dyeing cotton light pink and mode shades with alizarin dyes. It consists of first treating the fiber with the dyestuff, and then impregnating with the mordant. A list of dyestuffs which can be used in this process and details of the procedure are given. RUBY K. WORNER

Tests on the penetration of dyestuffs through cotton oiled in the picker room. A. H. GRIMSHAW. N. C. State College Textile School. *Textile World* 74, 1655–6 (1928).—Comparative dyeing tests are described which show that a suitable emulsifiable mineral oil sprayed on cotton in the picker hopper will not interfere with the uniform distribution of direct, vat or sulfur dyestuffs, or their penetration through the fiber. RUBY K. WORNER

Dyeing fabric composed of rayon and cotton. G. RUDOLPH. *Leipzig. Monatschr. Textil-Ind.* 43, 167–8(1928).—While the even wetting of the material with the aid of such products as Nekal BX is useful in the dyeing of mixts. of cotton and rayon, it is no cure-all and level dyeing requires great attention to details. In the dye bath choice should be made between monopol oil, monopol brilliant oil and Marseilles soap based on the specific properties of the dyes used. The object of the selection is control of the rate of dyeing. Not over 0.5% Na_2CO_3 is permissible on light shades and not over 1.0% in any case. Light shades should be dyed below 25° and the temp. even for dark colors should not exceed 40°. In general the cotton is dyed more heavily than the rayon at lower temp. and the reverse becomes true as the temp. is raised. E. R. CLARK

Dyeing fast and uniform shades (on rayon). J. WM. WALSH. Textile Silk Dye Works. *Textile World* 74, 1591–2(1928).—General. RUBY K. WORNER

Dyeing and finishing (rayon) knit goods. ANON. *Textile World* 74, 1603–4 (1928).—Practical. RUBY K. WORNER

Developments in dyeing, delustering, scrooping, and related rayon processes. P. D. ATWOOD. DuPont Rayon Co. *Textile World* 74, 1610–1(1928).—A review. RUBY K. WORNER

Dyeing skein silk. T. COPLEY. *Dyer, Calico Printer* 60, 61(1928).—Suggestions for the selection of dyestuffs and assistants for producing light and heavy shades are given. Temp. plays an important part in the leveling of the dye. Only the softest water should be used. RUBY K. WORNER

Ammonium sulfite as leveling agent in wool dyeing. JOACHIM MÜLLER. *Dyer, Calico Printer* 59, 194(1928). RUBY K. WORNER

The dyeing of Phormium fiber. FRED. GROVE-PALMER. *Dyer, Calico Printer* 60, 80–1(1928).—Direct dyes are recommended for the paler shades, and acid colors for the darker ones. Basic dyes are seldom used except for topping off a shade. If fastness

is important, S dyes are best. A description of the cultivation, prepn. and uses of *Phormium* fiber (New Zealand flax) is included. Ruby K. Worner

Dyeing kapok. E. Meissner. *Leipzig. Monatschr. Textil-Ind.* **43**, 169(1928).—Direct dyes are ordinarily used. In applying them alky. must be avoided and it is well to use a large amt. of Na_2SO_4, up to 40–80%. The material is worked 1.0–1.5 hrs. at the boil. Acid colors may be applied with the aid of alum. The S colors are applicable if min. amts. of Na_2S and no Na_2CO_3 are employed. E. R. Clark

Lichen dyeing to-day: the revival of an ancient industry. A. R. Horwood. *Science Progress* **23**, 279–83(1928).—A description is given of the dye lichens, lichen colors and dyes and the methods used in the prepn. and application of these dyes. They are used chiefly for wool yarns, and home-spuns. Joseph S. Hepburn

Dyeing colored-toned window shades. George Rice. *Dyer, Calico Printer* **60**, 74–5(1928).—Descriptive. Ruby K. Worner

Textile industry of the Rhine Valley. *Leipzig. Monatschr. Textil-Ind.* **43**, special supplement to issue for July, 1928.—Describes factories, including newer industries, for manufacturing and processing textiles and making dyes and textile chemicals and schools and textile research labs. E. R. Clark

Common impurities in textile trade chemicals. E. T. Ellis. *Indian Textile J.* **38**, 296(1928).—The most usual impurities in $CaCO_3$, $Al(ClO_3)_3$, $BaCl_2$, CrF_3, BaO_2, $Al_2(SO_4)_3$, $Cr(CNS)_3$ and NH_4 vanadate are discussed. Ruby K. Worner

Illumination from above in the microscopy of textiles. Alois Herzog. *Melliand Textilber.* **9**, 748–52(1928). E. R. Clark

Ultra-violet light in textile examinations. H. Sommer. *Melliand Textilber.* **9**, 753–5(1928).—While the examination of samples of textile materials, especially such as may not be destroyed, under the light of the quartz tube arc gives data at times of interest, the method has distinct limitations. For example, the dye present may entirely obscure the fluorescence color peculiar to the fiber in question and even give an entirely false conclusion. No certain distinction between flax and hemp under such illumination can be made. Bleached linen and cotton are not distinguishable, nor are mohair and wool. The reddish white luminescence of copper rayon is distinct from the yellowish cast of that of viscose rayon. For the identification of dyes the method is of but little real value. However, American cotton dyed to imitate Egyptian is readily detd., as is dyed wool as a substitute for camel hair. Alkali damage to wool corresponding to 30% loss in strength is not determinable, nor is acid damage to wool. Ultra-violet light makes oil spots on fabric especially distinct. Sulfite cellulose pulp is not distinguishable from soda pulp after the former has been exposed to bright light. Otherwise a distinction can be recognized. Instead of the Hg arc, a type giving a more continuous ultra-violet spectrum would be worth studying. E. R. Clark

Some measurements of the transmission of ultra-violet radiation through various fabrics. W. W. Coblentz, R. Stair and C. W. Schoffstall. *Bur. Standard J. Res.* **1**, 105–24(1928). E. J. Crane

Many imitations and grades of purity among fibers make identification by microscope best. John H. Skinkle. *Textile World* **74**, 1811–2(1928).—The microscopic appearances are given of wool, mohair, camel hair, true silk, Tussah silk, sea silk, cotton, mercerized cotton, kapok, flax, hemp, jute, ramie, Manila hemp, sisal hemp, New Zealand flax, shoddy and the rayons, including acetate, nitro, cupra and viscose. Ruby K. Worner

Conditioning small samples of fiber. Horace Fleming. *Textile Colorist* **50**, 253(1928).—A simple method, ascribed to Rawson, for detg. the dry wt. of small samples is described. Ruby K. Worner

Influence of active oxygen upon fiber strength. B. Walther. *Seifensieder Ztg.* **55**, 249–51(1928).—Washing expts. (laundered 100 times) were made with "Persil" and with soap alone on cotton and half linen, test strips of 2.5 in. × 0.8 m. being used. The results show a gradual but markedly greater decrease in tensile strength in all cases where active O_2 ("Persil") had been used than in cases where soap alone was employed. P. Escher

The injury of textile fibers by light and weather. H. Sommer. *Z. ges. Textilind.* **30**, 465–8, 482–3; *Chem. Zentr.* **1927**, II, 1417.—The destruction of fibers which occurs on weathering is a process which takes place largely on the surface exposed to light, and is due to the short wave lengths, principally ultra-violet rays. Moisture, contrary to previous opinions, furthers the deterioration, especially with wool and bast fibers. The compn. of the atm. is likewise a factor; the purer the atm., the less the destruction. The sensitivity of the investigated fibers to weathering varies greatly. Expressed in the hours of sunshine which are required to cause a loss of 50% in tensile strength they

fall into the following order: silk (200), jute (400), artificial silk (900), cotton (940), flax (990), hemp (1100), raw wool (1120), chromed wool (1900). In this evaluation the varying thickness of the substances was not taken into consideration. J. S. R.

Various causes of deterioration of fabrics. B. Setlik. *Chimie et industrie* **Special No.**, 466 (April, 1928); cf. *C. A.* 21, 3465.—Three cases are described: one was due to the presence, in the size, of $MgCl_2$ and $MgSO_4$, hydrolysis of which had given rise to the formation of free acid; the 2nd was due to the cutting of the silk warp by the hard and highly twisted rayon filler; the 3rd was traced to the action of sunlight. A. Papineau-Couture

Skin irritation caused by textile fabrics. S. R. Trotman. *Textile Recorder* **45**, No. 541, 70, 65(1928).—An investigation of a large no. of cases showed that most of them concern wool, fur or hair, rarely cotton or silk goods. Woolen underclothing and hosiery, both dyed and undyed, are frequent causes of irritation. Low-grade wool may contain H_2SO_3 from the stoving process, which, when combined, may be liberated by perspiration, and when free, is absorbed directly by the skin. Peroxide bleaching destroys the ability of this wool to produce irritation. In dyed hosiery, the source of irritation may be unremoved H_2SO_4, sol. Cr salts, dichromates or other mineral salts used as mordants. Occasionally septic sores may be traced to pathogenic bacteria which have found access to the finished garment. Incomplete removal of phenylenediamine is the chief cause of outbreaks of dyed fur dermatitis. It is suggested that $Hg(NO_3)_2$ and Cu and Zn salts used in the "carrotting" process for the velour hats now in vogue may cause a dermatitis on the exposed portions of the neck. R. K. W.

Oxycellulose and the determination of the degree of mercerization. E. Ristenpart. *Melliand Textilber.* **9**, 577–9(1928).—If mercerizing is accompanied by over-bleaching, Lange's test with iodo-$ZnCl_2$ soln. gives misleading results. For example a mercerized but over-bleached yarn was given the same color rating after washing out the stain as was the same yarn prior to mercerizing. Apparently mercerized cellulose when oxidized loses its power of forming a semi-stable compd. with I_2. Microscopic study is the best method of detg. mercerization. E. R. Clark

What characteristics to look for in acceptable sizing material. H. D. Martin. *Textile Colorist* **50**, 237–8(1928).—Desirable characteristics of an ideal sizing compd. are strength-imparting, penetrativeness, fluidity, adhesiveness, freedom from brittleness, no tendency to scale, transparency, odorlessness, elasticity, absence of stickiness, smoothness, cleanliness, preservativeness (not easily deteriorated), vermin-proofness, good stripping quality, vanishment (in some cases it is desirable to have the sizing material shake off and disappear in weaving process), color absorption and inexpensiveness. R. K. W.

An ingenious hand-driven sizing machine. Anon. *Indian Textile J.* **38**, 127–8 (1928).—An illustrated description of the Amalsad patent hand-driven, forced-hot-air sizing machine, which was developed to suit the requirements of hand-loom weavers. Ruby K. Worner

The iodometric evaluation of oxidizing agents for desizing fabrics. R. Haller, J. Hackl and M. Frankfurt. *Melliand Textilber.* **9**, 758–9(1928); cf. *C. A.* **22**, 3050.—While the course of the hydrolysis of starch with oxidizing agents is not definitely known, iodometric methods for following the rate of hydrolysis, based on the formation of maltose, give practically valuable results. E. R. Clark

Hypochlorite bleaching. J. Auerbach. *Melliand Textilber.* **9**, 769–70(1928).—The effect of HOCl on the N compds. present in cotton after alk. digestion is oxidizing and chlorinating. The former leads to the formation of ketone acids of type formula RCOCOOH, while the latter results in formation of chloroamines having type formula RCH(NHCl)COOH. Along with the production of the oxidation products, NH_3 is formed, which with HOCl yields NH_2Cl. Treatment with $NaHSO_3$ eliminates all chloroamines, which in themselves have no bleaching action. E. R. Clark

Newer views on bleaching of vegetable fibers. V. Ježek. *Chem. Obzor* **3**, 197–9 (1928).—A review. Jar. Kučera

"Pinking" of bleached cottons. L. J. Matos. *Textile World* **74**, 1675(1928).—Evidence is presented against the prevailing opinion that the discoloration is due to mildew. Oxidation of the cotton by H_2SO_4 and reaction with aniline fumes in the air has been suggested as a cause. Another possibility is that bleached cotton packed in shipping cases with waterproofed paper linings might, under the heat of the warehouses, react with some of the volatile constituents of the waterproofing material and form a colored compd. Ruby K. Worner

Forty years in cotton-print industry. Preparation of formulas, production, piece-work, determination of cost of production. Henri Zublin. *Tiba* **6**, 405–17, 567–85,

777–81, 881–9, 1029–39(1928).—This article gives the result of 40 yrs.' experience in plants mfg. a wide variety of articles in Austria, France, Germany and Italy.
A. Papineau-Couture

Purification of cotton. V. Shaposhnikov and S. Yeserskii. *Z. Farben-Ind.* **20**, 60–4, 131–3, 177–80(1928).—A study is made of the kiering and bleaching of cotton to det. the best conditions for conducting these processes. The optimum conditions found for kiering are as follows: 6 hrs. with 3% NaOH, 3 atms., ratio of cellulose to NaOH 100:8. The criteria used for judging the kiering conditions were the oxidizability of the waste liquor, a measure of the loss of cellulosic material, and the consumption of NaOH due to reaction. A study of the increased consumption of Cl with increased time of bleaching showed that the use of concns. of Cl over 1.0 g. per l. is unnecessary. With 0.5 g. Cl per l., after 4–6 hrs. the concn. was 0.0142%, while after 18 hrs. 0.0134%. S. and Y. assume, therefore, that the consumption of Cl at first is due mainly to adsorption, and this Cl hardly takes part in the bleaching. In favor of such an assumption is cited the fact that cotton removed from the bleach liquor retains the odor of Cl even after a great deal of washing, a treatment with antichlor (hyposulfite) soln. being necessary to remove the odor of Cl. After the removal of the cotton, the bleach liquor possesses a milky turbidity, the particles consisting of $CaCO_3$, very short fibers, and a small ppt. insol. in warm dil. HCl. The amount of this ppt. was too small to be identified. This series of articles is being continued. Frederick C. Hahn

The detection and determination of acidity and alkalinity in cotton and other cellulose materials. S. R. Trotman. *Dyer, Calico Printer* **60**, 116–7(1928).—The work of Coward and Wigley (*C. A.* **16**, 3000) on spotting tests, the method of Procter and Hirst for the indirect detn. of mineral acid by incineration and titration with methyl orange, and the method of Innes by means of H-ion concn. are cited. R. K. W.

The effect of organic acids on cotton at 105–110°. E. Ristenpart and K. Petzold. *Leipzig. Monatschr. Textil-Ind.* **42**, 389, 390(1927); *Expt. Sta. Record* **57**, 899.—Cotton treated with 1% acetic, formic, or lactic acid could be dried at temps. up to 110° without substantial damage. Tartaric acid should evidently be avoided in the final washing. Its detrimental effect sets in especially after evapn. of the water and with consequent concn. of the acid. While initial damage is caused by the rapid evapn. in drying the cotton at 100° and over, further heating results in recovery such that the cotton is no longer exposed to attacks of the acid. Acid-treated cotton persistently retained traces of acid after drying. Mercerized cotton seemed in general to be resistant to acids. H. G.

Chemistry of kier boiling (of cotton). M. Chilikin. *Melliand Textilber.* **9**, 397–404(1928).—Sepn. and identification of the components of kier liquor show that during the boiling the following actions take place: (1) olein, etc., are saponified; (2) esters of cerotic, carnaubic, and melissic acids are to a slight extent saponified, but for the most part are emulsified; (3) N-contg. substances are hydrolyzed and the resulting amino acids are neutralized; (4) pentosans are decomposed completely; (5) hydrocarbons and gossypyl alc. are emulsified. The emulsification is promoted by an unidentified N-contg. substance which loses part of its emulsifying power as the liquor is cooled.
E. R. Clark

The nature of mineral-oil stains on unbleached cotton fabrics and the direction in which investigations should be carried out. H. Sunder. *Chimie et industrie* **Special No.**, 417–4(April, 1928); cf. Mennecke, *et al.*, *C. A.* **22**, 3784. A. P.-C.

Influence of laundering on cotton fabrics, especially with washing agents containing sodium perborate. P. E. Raaschou and V. Ahrend Larsen. Polytechnical College, Copenhagen. *Ind. Eng. Chem.* **20**, 916–22(1928).—Extensive washing tests are reported for heavy unbleached and light cotton fabrics soiled with mixed fruit juices for slight soiling and with tea and claret for more intense soiling. To obtain a basis of comparison, washing tests were carried out with soda, NaOH, water glass, and soap solns., both sep. and mixed with each other, partly with and partly without $NaBO_3$. To det. the purely mechanical wear occurring in home laundering, some hand-washing tests were conducted. Studies were also made of the processes of decompn. of perborate in the various washing prepns. and mixts. thereof; of the effect of ions on the rate of decompn. of the perborate; of the relation between loss in weight and loss in strength during washing; and of the ash and incrusted substances formed by adsorption on the fabric.
Ruby K. Worner

From cotton to rayon. R. A. Kölliker. *Z. Farben-Ind.* **20**, 135–6(1928).—A review of the chemistry, methods of prepn. and properties of different varieties of rayon used up to the present time. Frederick C. Hahn

Modern methods and trends in processing cotton-rayon woven fabrics. Winn W.

CHASE. *Textile World* **74**, 1605–7(1928).—Desizing, scouring, bleaching, dyeing and finishing are considered. RUBY K. WORNER

A year's progress in rayon by producers, equipment builders, and mills. JAMES W. COX, JR. *Textile World* **74**, 1595–7(1928).—A résumé. RUBY K. WORNER

Science offers increasingly powerful weapons for the attack on rayon research problems. EDWARD R. SCHWARZ. *Textile World* **74**, 1607–8(1928).—The modern well-equipped textile-testing lab. includes optical equipment of varied nature, elec. measuring devices, x-ray, spectrophotometric app., etc. RUBY K. WORNER

Methods of identifying rayons as to group, type and probable manufacturer. ARTHUR K. JOHNSON. *Textile World* **74**, 1600–3(1928).—A procedure is suggested for the systematic examn. of an unknown sample. Phys., chem. and microscopic tests are described, and the need of caution in interpreting the results is stressed. R. K. W.

Graphical methods greatly simplify the solution of rayon mathematical problems. A. S. MARK. *Textile World* **74**, 1598–1600(1928); cf. *C. A.* **22**, 3783.—A logarithmic chart is proposed for finding equiv. cotton and worsted counts and counts of combination yarns of any denier of rayon. RUBY K. WORNER

Stability test for rayon. P. KRAIS. *Leipzig. Monatschr. Textil-Ind.* **43**, 257 (1928).—Nitro rayon is not unique in being in some cases subject to loss of strength in heating and accelerated aging tests. Some viscose samples tested similarly showed losses of one-third their original strength. The acetate fibers examd. showed good stability. E. R. CLARK

Progress in making rayon warps—refinements in preparatory processes. RAY WINDER. *Textile World* **74**, 1587–8(1928).—The features of the Van Vlaanderen rayon warp-sizing machine are described and compared with those of the ordinary cotton slasher. RUBY K. WORNER

Preparation of cross sections of rayon. ALOIS HERZOG. *Melliand Textilber.* **8**, 429–30(1927); cf. *C. A.* **22**, 2843.—A slight twisting of the bundle of fibers after coating with collodion and before setting takes place gives the sections rigidity. Oblique microscope illumination adds to definition of unstained sections. E. R. CLARK

Proper oiling of rayon yarn declared greatest problem facing knitting trade. ANON. *Rayon* **5**, No. 8, 20–3(1927).—Pure mineral oils do not appear to give the best results and many knitters are using blended or processed oils. Some knitters are having success with a mixt. of good-grade neatsfoot and mineral oils. It should not be necessary to use a boiling soap soln. to scour out the oil, as this may cause streaky dyeings. CHAS. E. MULLIN

The sizing of artificial silk on the warp beam. WILLIAM BENNETT. *Indian Textile J.* **38**, 302–4(1928).—General discussion of the selection of sizing material and description of a suitable type of warp sizing machine. RUBY K. WORNER

The physico-chemical nature of natural silk solutions in neutral, acid and basic solvents. P. P. VON VEIMARN. *Kolloid Z.* **46**, 40–3(1928).—Fresh silk may be swollen in water or dil. salt solns. whereas ordinary silk is insol. Solns. of silk in neutral salt aq. solns. may be likened to the colloidal and true solns. of AgI in KI and $AgNO_3$ solns., as the fibroin possibly forms complexes with the salt. In consequence of its amphoteric nature fibroin forms unstable complexes with acids and bases through water elimination similarly to $Al(OH)_3$. L. F. MAREK

Investigation of the behavior of silk coagulum in polarized light while undergoing dehydration and aging. P. P. VON VEIMARN. *Kolloid-Z.* **46**, No. 1, 36–8(1928).—During dehydration and aging of a silk coagulum from a sirupy liquid, the mass passed through the stages of a viscous fluid, a rubbery, elastic jelly, to a hard, brittle mass. The following was observed in a microscopical examn. of the swelling of silk in a hot aq. soln. of NaI: with swelling the structure became more pronounced as bundles of thin, ultra-microscopical fibrils; these bundles twisted into spirals which remained wound about the fiber; the fiber became a sirupy mass and the bundles melted into long drops. In polarized light the bright interference colors were observed to fade as swelling progressed and to disappear at complete swelling with only dark and bright spots remaining. A coagulum from silk dispersed in NaI at 130° and coagulated in 4 *N* sodium citrate was spun into a thread and examd. in polarized light. The more or less spiral lines are seen. The interference colors begin to appear and soon cover the entire thread. It was shown that fibers formed from silk coagulum are not essentially distinguishable from natural silk with regard to interference colors and inner structure. L. F. MAREK

Formula for calculating the yield of loading in silk from the ash content. M. DAVID. *Tiba* **6**, 1011, 1013(1928).—If p = wt. of loaded silk taken and c = wt. of anhyd. ash

found, the yield of loading on the amt. of raw silk originally taken is given by $R\% = 100\left(\frac{0.75}{1 - (1.27c/p)} - 1\right)$. A. Papineau-Couture

The tin weighting of silk. Fred. Grove-Palmer. *Indian Textile J.* **38**, 236 (1928).—General. Ruby K. Worner

Lustering silk by mechanical means. James R. Spencer. *Textile Colorist* **50**, 181(1928).—The fiber is stretched in contact with polished metal rollers, after which it may be steamed. Chas. E. Mullin

Effects of sodium hydroxide on linen. M. M. Chilikin. *Melliand Textilber.* **9**, 592–4(1928).—Linen already has many of the phys. properties of mercerized cotton, and investigations of the mercerization of linen have but little com. significance. Efforts have, however, been made to utilize the cottonizing action of concd. NaOH solns., and further studies may give data of significance to cotton mercerizing. The full mercerizing action takes place on linen at lower concn. than is noted on cotton, the absorption curve reaching practically a max. at about 12% NaOH. Mercerized linen is more readily dyed in pure full shades with vat dyes than is the untreated material. E. R. Clark

Hydron colors on linen fabrics. Anon. *Textile Colorist* **50**, 173–5(1928).—Methods and formulas for dyeing. Chas. E. Mullin

The properties of wool. L. Meunier and G. Rey. Univ. de Lyon. *Chimie et industrie* Special No., 722–7(April, 1928).—See *C. A.* **22**, 1047. A. P.-C.

The visible alterations in wool after being treated in acid chemic vats. Alois Herzog. *Textile Recorder* **45**, No. 541, 63–5; **46**, No. 542, 57–61(1928).—See *C. A.* **22**, 1046. Ruby K. Worner

The protection of woolen goods from damage by alkalies. S. R. Trotman. *Textile Recorder* **46**, No. 543, 57–8(1928).—Alkali damage can be inhibited or limited by the use of some chemical which forms a compd. with the wool not readily attacked by alkali by adding to the bath a substance which forms an adsorption compd. or a loose chem. compd. with the alkali, or by the addn. of a chemical which inhibits hydrolysis of the soap. Examples of each type of protection are given. Ruby K. Worner

Analytical study of the washing of raw wool. L. Leites, N. Zaussoilov and E. Jurzeva. *Leipzig. Monatschr. Textil-Ind.* **43**, 212–3, 263–4(1928).—Analyses were made of the liquor and of the wool at various stages of its treatment in a continuous washer. The greatest percentage of unsapond., that is emulsified, fat is obtained at the first squeeze roll, and as the wool is carried along the unsapond.-fat content decreases rapidly. For max. recovery of lanolin under favorable conditions for purification, special attention should be given to the first washing compartment and its squeezing system. The wool entering the dryer contained 46.8% H_2O and 0.188% alkali. E. R. Clark

The practice of successful wool scouring. A. W. Davison. *Dyestuffs* **29**, 57–9 (1928).—"The first requirement for successful scouring is that the stock be well opened out before being delivered to the train." Scouring liquors should be changed before they become too dirty so as to avoid trouble in the dyeing and other subsequent processes. Chas. E. Mullin

The Netz method of scouring wool. Eduard Langer. *Textile Recorder* **46**, No. 542, 53–4(1928).—The Netz method, invented in Germany prior to the war, has not become established because of a series of adverse circumstances. According to this method, the wool is supported by grates in a hermetically sealed extractor and is surrounded during the scouring process by a circulating layer of air, and during the additional removal of the fat solvent, it is dried with a circulating current of air. The solvents are chlorinated hydrocarbons, especially di- and tri-chloroethylene. It is claimed that wool thus treated is of much better quality and finer than that worked by other methods, and that this process is less expensive in spite of the greater cost for the plant. For patents on the process, see *C. A.* **8**, 828, 1860. Ruby K. Worner

Self-ignition of oiled wool. H. Oestermann. *Leipzig. Monatschr. Textil-Ind.* **43**, 162–3, 210–1, 258–9(1928).—Tests with Mackey app. confirm the superiority of olive and peanut oils from the standpoint of hazard of self-ignition of the fiber, and the dangerous catalytic action of Mn and Fe resinates and similar driers. Of inhibitors for self-ignition S showed special effectiveness. Self-ignition is rare in wool contg. over 10% moisture. E. R. Clark

The action of bichrome on wool. C. York. *Dyer, Calico Printer* **59**, 262–3; **60**, 6–7; 32–4(1928).—General discussion. To insure uniform results, old chrome baths are to be avoided. Tendering of wool is ascribed to its reaction with NaOH formed by dissocn. of $Na_2Cr_2O_7$. Practical experience is cited in support of this hypothesis. Ruby K. Worner

Finishing mohair velour. Wilhelm Kegel. *Leipzig. Monatschr. Textil-Ind.* **43,** 191(1928).—The objects of the finisher should be to impart the desired luster and softness, and yet to leave the nap erect and resistant to crushing. After shearing, the material is steamed for 0.5–1.0 hrs. at 1.5–3.0 atm. with dry steam. The app. should be free from air, and the steam removed by suction. In any hot treatment care must be taken to avoid crushing or folding until the material is cooled, as otherwise stubborn wrinkles are formed. After dyeing operations passage through 1% glycerol soln. is desirable. E. R. Clark

Density of yarn packages. Anon. *Textile World* **74,** 1679(1928).—The "Durometer," an instrument for testing the density of wound packages of yarns, such as bobbins, spools, cones, tubes, quills and beams, is described and illustrated. R. K. W.

Throwster clearances on crepe. Warren P. Seem. *Textile World* **74,** 1673–5 (1928); cf. *C. A.* **22,** 3784.—The factors affecting throwster clearances and the "fixing" of returns are discussed. Ruby K. Worner

***p*H and detergent action.** Chas. E. Mullin. *Textile Colorist* **49,** 665–8(1927).—The theory of detergent action (surface tension, emulsification and pedesis) is discussed and the effects of p_H upon the cleansing action of detergent solns. are described. Apparently the cleansing action of a detergent soln. increases almost as a straight line when the cleansing action (ordinates) is plotted against the p_H (abscissae) of the soln. The falling-off in cleansing action of detergent solns. in continuous use is explained and the "break" in continuous scouring is described and discussed. There is no relation between the p_H of the soln. and the break, which appears to be due to the exhaustion of colloidal soap from the soln. More research is needed along these lines. C. E. M.

Wetting agents. Albert Landolt. *Melliand Textilber.* 9, 759–65(1928).—A general survey of the theory and practice involved in the manuf. and use of wetting agents as aids in dyeing, mercerizing, carbonizing, etc. In discussing the various classes of substances used it is noted under soaps that the size of particle must approach colloidal dimensions before wetting is efficient. Examples of soaps contg. fat-dissolving chlorinated hydrocarbons are Lanadin, Hydrapthal, Terpuril, Cycloran and Sovental. For the evaluation of sol. oils, the estn. of SO_3 is to be recommended. Prestabitol is an example of this type of material. Some prepns. contain also chlorinated hydrocarbons. Alkylnaphthalenesulfonic acids, typified by Nekal and Neomerpin, are finding increasing usage. There are several wetting materials which must be classed as chem. individuals. Prominent examples are the "carnites" such as Tetracarnite, derived from pyridine, and products based on cholic acid and diethylamine. Tests of wetting agents should cover chem. analysis, stability against working conditions such as hard water, drop-number detn., wetting-power detn., and practical works trial. Of methods for detn. of wetting power, those of Erban, Herbig and Ristenpart are most widely used. The first notes the sinking time for a sample, and is subject to the difficulty that entrapped air effects the results. The second, sometimes called the centrifugal method, dets. the wt. of water absorbed. The third is a refinement of the time for sinking test and employs a short bit of cotton thread slightly weighted at the free end. The wetting power of prepd. solns. shows no general relation to concn., and drop numbers do not coincide with practical results. The alkylnaphthalenesulfonic acids work better at low temp. than at high. E. R. Clark

Testing waterproofed coatings. Kenneth E. Marsden. *Textile Recorder* **46,** No. 543, 67(1928).—The specified test for army, police, naval or air-force great-coats is that from a height of 6 ft., water is dropped on to a pattern, tilted at an angle of 45 degrees, at the rate of 18 drops per min., each 18 drops to measure 1 cc. Diagrams of the dropping app. are given. Ruby K. Worner

Tarpaulins. Fred. Grove-Palmer. *Textile Recorder* **46,** No. 542, 37–8(1928).—A general description of the French, Scottish and American methods of prepg. tarpaulins. Ruby K. Worner

Some useful recipes. Clifford R. Carter. *Dyer, Calico Printer* **60,** 104–5 (1928).—Tested recipes are given for the following: *sizing for finishing and polishing twines,* including sash cords, fine and coarse twines and jute twine; *thread polishing,* including medium glacé and silk finishes, and glacé or hand-finished thread; *cleaning of calendar rollers; dressing for jute warps; tannin treatment* for preserving sails, ropes, nets, etc.; *weather-proofing twine; grease for hemp ropes; removal of mineral oil stains from linen, etc.; dressing* for thin finish for fine linen; and *prevention of mildew.* Ruby K. Worner

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A micro-method for the determination of the Cu number of cellulose (Heyes) 23.
Results obtained with a Ruth's accumulator in a textile plant (Severin, Scupin) 13.

Dyeworks sulfites from waste (ELLIS) **18.** The reason for a rubber-like condition of matter (VON VEIMARN) **2.** Pyrometers for surface temperature measurements (ANON.) **1.** New developments with dispersed rubber (WINKELMANN) **30.** Viscosity of glycogen and some dyestuffs and a relation between gelation and double refraction (BANERJI, DHAR) **2.** The dyeing of velvet or suede leathers (LAMB) **29.** Adsorption by decolorizing earth in nonaqueous solutions (NEUMANN, KOBER) **2.** Wetting agents [for use in textile industry] (Brit. pat. 284,249) **18.** 1-Phenyl-3,4-trimethylenepyrazolone (U. S. pat. 1,685,407) **10.** Tetranitrodianthrone (for making dyes) (U. S. pat. 1,686,-992) **10.** Drying cylinder for textiles, etc. (Austrian pat. 109,048) **1.** Solubilizing higher alcohols (Fr. pat. 635,977) **10.** "Painting-ground" for artists (Brit. pat. 284,363) **23.** Extracts from glands of sharks, etc. [in ungumming silk] (Brit. pat. 284,668) **17.** Dyeing pearl chips (U. S. pat. 1,685,451) **18.** Detergent compositions (Brit. pat. 285,473) **27.**

ZUBLIN, HENRI: **40 Jahre Kattundruck.** Singen-Hohentwiel: Berchtold and Gommeringer. Reviewed in *Bull. soc. ind. Mulhouse* **94,** 379–80(1928).

Dyes. MARCEL BADER and CHARLES SUNDER. Fr. 32,721, Oct. 23, 1926. Addn. to 551,666. Leuco derivs. of vat dyes are treated with pyrosulfuryl chloride to obtain derivs. used for dyeing and printing. In examples, the leuco deriv. of dibromoindigo and of 4,5',7'-trichloroindigo in a mixt. of dimethylaniline and chlorobenzene is so heated. Leuco derivs. of the thioindigo and anthraquinone series may also be used.

Dyes. J. R. GEIGY A.-G. Brit. 284,614, Jan. 31, 1927. Various specified isorosindulines in which at least 2 sulfonic groups are present are used for the production of phenonaphthosafranines according to the process described in Brit. 265,986 (*C. A.* **22,** 503). The positions 4, 8, 9, and 11 to 15 may be substituted by alkyl, hydroxy, alkyloxy, carboxy, acidylamino or sulfo groups or by halogen. A 1-chloro-3-diethylisorosinduline-12-sulfonic may be prepd. by coupling 3'-sulfophenyl-2-naphthylamine with nitroso-*m*-chlorodiethylaniline and after sepn. converted into the corresponding 6,12-disulfonic acid and this product may then be coupled with 1-methyl-2-ethylamino-5-aminobenzene-4-sulfonic acid. The dye thus formed dyes wool from a H_2SO_4 bath fast greenish blue shades. Other examples also are given. Brit. 284,615 specifies the use of an isorosinduline having no acid substituents in the 1, 2 and 4 positions. A sulfonic group may be present in the 6 and also in the 8, 9, 12, 13 and 14 positions and a neutral group such as methoxy or ethoxy may be in the 1, 2 and 4 positions while any univalent group may occupy the positions 7 to 10 and 11 to 15. 3-Diethylisorosinduline-12-sulfonic acid is made by coupling 3'-sulfophenyl-2-naphthylamine and nitrosodiethylaniline, converted into the 1,12-disulfonic acid, and the latter then coupled with 1-methyl-2-ethylamino-5-aminobenzene-4-sulfonic acid to produce a safranine.

Dyes. I. G. FARBENIND. A.-G. Brit. 284,242, Jan. 25, 1927. Anthraquinone derivs., some of which are suitable for dyeing "acetate silk," are produced by the interaction of hydroxyanthraquinones upon ethylenediamine; *e. g.*, quinizarin may be introduced into ethylenediamine hydrate; crystals of a salt-like product of the 2 compds. at first sep. but on warming the new product is obtained. When quinizarin can no longer be detected spectroscopically the mass is dild., filtered, washed with HCl and water and recrystd. Compds. are similarly prepd. from purpurin and 1,2,4,5,8-pentahydroxyanthraquinone or 1,4,8-trihydroxyanthraquinone by reaction with ethylenediamine hydrate.

Dyes. I. G. FARBENIND. A.-G. Brit. 284,288, Jan. 27, 1927. Thioindigoid dyes are made by condensing arylthioglycolic acids with *o*-diketones such as acenaphthenequinone, or isatin and its homologs or substitution products or α-derivs., in the presence of P_2O_5, preferably together with a solvent or dispersing agent. Several examples are given.

Dyes. I. G. FARBENIND. A.-G. Brit. 285,389, Feb. 14, 1927. 2-Thionaphthene-3-indoleindigoid dyes are made by condensing 6-aminohydroxythionaphthene with a 5,7-dihaloisatin and then introducing 2 Cl atoms into the 5,7-positions on the thionaphthene side, or by condensing 5,7-dichloro-6-aminohydroxythionaphthene with a 5,7-dihaloisatin. Sulfuryl chloride may be used for the chlorination. Examples are given, the products of which give brown dyeings on cotton from the vat.

Dyes. I. G. FARBENIND. A.-G. Brit. 285,502, Feb. 18, 1927. Vat dyes giving blue to violet or black shades on cotton are obtained by heating polyhalopyranthrones or their derivs. with such quantities of N-contg. compds. (suitably α-aminoanthraquinone, 1-amino-4-methoxyanthraquinone or 4-amino-1,1'-dianthrimide) in which

at least one reactive H atom is connected to the N atom that several or all of the halogen atoms are substituted by nitrogenous radicals.

Dyes. I. G. FARBENIND. A.-G. Brit. 285,504, Feb. 18, 1927. Dyes are made by condensing at both amino groups, diaminophenyl or its derivs., with halonitrosulfonic acids of the benzene or naphthalene series in which the halogen atoms are exchangeable. Numerous examples are given for producing dyes dyeing animal fibers greenish yellow to brownish red tints. In producing the dyes, org. solvents may be used as may also acid-binding substances such as NaOAc or Na_2CO_3 and catalysts such as Cu. The process may be effected under pressure.

Dyes. I. G. FARBENIND. A.-G. Brit. 285,555, Nov. 16, 1926. Vat dyes are made by heating a 2-halo-1,9-pyrazoleanthrone with an acid-binding agent such as KOAc and a metal compd. such as Cu acetate (suitably by boiling in $PhNO_2$). A dye may be obtained which dyes cotton fast red shades from a blue hyposulfite vat.

Dyes. I. G. FARBENIND. A.-G. Fr. 635,225, May 30, 1927. Clear and stable violet dyes are prepd. by brominating monoalkyl-2,2-indolethionaphthenindigos in H_2SO_4 as solvent till 2 atoms of Br are absorbed. Examples are given of the bromination of the 7-methyl and the 6-methyl compds.

Dyes. I. G. FARBENIND. A.-G. Fr. 635,311, May 25, 1927. 2,2′-Dimethyl-*ms*-benzodianthrone or its derivs. are treated with alk. agents, such as Na_2CO_3, AcONa or KOH with or without solvents or diluents, whereby the Me groups combine to form another 6-C ring. The new compds. called *allo-ms*-naphthodianthrones color cotton in shades from orange to brown from the vat. They can be transformed into new vat dyes, *ms*-anthradianthrones, by treating with $AlCl_3$, etc., or by submitting them in H_2SO_4 soln. to the action of light or oxidizing agents. *ms*-Anthradianthrones are also prepd. by treating 2,2′-dimethyl-*ms*-naphthodianthrone or its derivs. with alk. agents. The dyeing properties are improved by introducing halogens. Several examples are given.

Dyes. SOC. ANON POUR L'IND. CHIM. À BÂLE. Brit. 284,656, Feb. 2, 1927. Chlorinated violanthrones which dye marine-blue shades fast to water are made by treating with Cl, at a temp. above 80° (suitably 130° in examples given), and in the presence of an inert diluent such as $PhNO_2$, dibromoviolanthrone, dichloroviolanthrone or like halogenated violanthrones instead of violanthrone itself as described in Brit. 262,774 (*C. A.* **21**, 3750). The product may have a Cl content between that of a tetra- and penta-deriv.

Dyes. SOC. ANON POUR L'IND. CHIM. À BÂLE. Brit. 285,096, Feb. 12, 1927. 1-Arylamino-4-aminoanthraquinones which contain in the aryl nucleus at least one amino group or a group derived from the amino group are made by condensing a 1-hydroxy- or 1-alkyloxy-4-aminoanthraquinone or a 1,4-diaminoanthraquinone with an aromatic diamine such as phenylenediamine, naphthylenediamine or benzidine, or a deriv., substitution product or homolog. The products may be used for dyeing cellulose esters and ethers such as cellulose acetate and in varnishes. Several examples are given of dyes giving blue colors.

Azo dyes. I. G. FARBENIND. A.-G. Brit. 285,097, Feb. 11, 1927. Mordant dyes giving fast brown shades when chrome-printed on cotton are made by coupling 2 mol. proportions of the same or different diazo compds. of the benzene series contg. the residue of an *o*-hydroxyarylcarboxylic acid with 1 mol. proportion of a 1,3-dihydroxy compd. of the benzene series. Several examples are given.

Azine dyes. J. R. GEIGY A.-G. Brit. 285,486, Feb. 19, 1927. By treatment with a sulfonating agent such as fuming sulfuric acid, an addnl. sulfonic group is introduced into the 16-position of a tri- or tetra-alkylphenonaphthosafranine (which may contain various substituents) which may also contain sulfo groups in the 1- or 2-positions and possibly also in 8-, 9-, or 11- to 15-positions.

Azo dyes. MELCHIOR BOENIGER (to Chemische Fabrik vorm. SANDOZ). U. S. 1,686,947, Oct. 9. Unsym. azo dyes are formed from equimol. proportions of a tetrazodiaryl such as diazotized benzidine or tolidine and a 2′-methyl-3′-amine-5′-sulfo-1-phenyl-5-pyrazolone in which either CH_3 or COOH is attached to the 3-position of the pyrazolone ring. Dyes thus produced dye cotton without mordanting in shades varying from orange to red and dark brown and can be diazotized and developed on the fiber. Their Na salts are readily sol. in water.

Azo dyes. I. G. FARBENIND. A.-G. Brit. 284,247, Jan. 25, 1927. Azo dyes are produced in substance or on the fiber by coupling with an arylide of 2,3-hydroxynaphthoic acid a diazotized *as-m*-xylidine substituted by a second amino group in *m*-position to the first with one or both of the H atoms of the second amino group replaced by

alkyl, aralkyl, benzoyl, substituted benzoyl or arylsulfonic acid groups. Examples are given of dyes producing bluish red shades on cotton.

Azo dyes. HUGO SCHWEITZER and WILHELM NEELMEIER (to Grasselli Dyestuff Corp.). U. S. 1,685,071, Sept. 18. An aromatic diazo compd. such as diazotized *o*-sulfanilic acid is coupled with the methylpyrazolone obtained from 4′-methyl-2-aminodiphenylsulfone-4-sulfonic acid or other suitable pyrazolone of a sulfonated aminodiarylsulfone. The dyes thus formed dye wool fast yellow.

Mordant azo dyes. ALFRED PHILIPS and MARTIN DABELOW (to Grasselli Dyestuff Corp.). U. S. 1,684,778, Sept. 18. The diazo compd. of 2-amino-1-phenol-4-sulfonic acid, 4-chloro-2-aminophenol-6-sulfonic acid or 4-nitro-2-aminophenol or other suitable *o*-aminohydroxy compd. of the aromatic series is combined with 2,6-dihydroxynaphthalene-3-carboxylic acid. The dyes thus formed may be used to obtain green shades by the one-bath chroming process.

Yellow azo dye. ERICH FISCHER and CARL E. MÜLLER (to Grasselli Dyestuff Corp.). U. S. 1,684,762, Sept. 18. A dye suitable for dyeing and printing "acetate silk" is prepd. by coupling diazotized *p*-nitroaniline with 1-nitro-2,4-diaminobenzene.

Dye composition. WINTHROP S. LAWRENCE. U. S. 1,684,401, Sept. 18. A compn. suitable for use as a printing paste comprises a basic-dye-Zn-tannate lake together with gum tragacanth or other suitable thickening agent and a glycolic compd., *e. g.*, ethylene glycol and ethylene chlorohydrin.

Naphthophenazine dyes. WILHELM NEELMEIER and THEODOR NOCKEN (to Grasselli Dyestuff Corp.). U. S. 1,686,026, Oct. 2. *p*-Alkyloxyarylamino-substituted 1,3-naphthylenediamine compds. are used to produce fast naphthophenazine dyes by condensation with *p*-nitrosoaminoaryl compds. or *p*-aminoazo compds. or by joint oxidation of the naphthylenediamines with *p*-diamines. The dyes produced are generally dark powders with metallic luster, sol in water with blue to violet colors, sol. in H_2SO_4 with green colors and dye wool from acid baths very level greenish blue to violet shades of good fastness to light. Several examples are given.

Vat dyes. I. G. FARBENIND. A.-G. Fr. 635,620, June 8, 1927. Hydroxyl compds. of ketones of the perylene series are alkylated so as to introduce a long chain consisting of a short hydrocarbon portion joined by an O or S atom to a second hydrocarbon portion. The dyes obtained are stable to light and are sol. in org. solvents, making them suitable for the prepn. of colored varnishes. In examples the oxidation product of dibenzanthrone obtained according to Fr. 451,798, is alkylated with $MeC_6H_4SO_3CH_2$-CH_2OR, in which R is Me or Et. The product dyes cotton blue from the vat. If R is Bu a brilliant powder relatively sol. in benzene is obtained, which gives a green varnish. If this ester contains glycol ditoluenesulfonate, it forms a blue dye as by-product, which can also be obtained from $(CH_2Br)_2$ and dihydroxydibenzanthrone. Cf. *C. A.* **22**, 3786.

Sulfuretted dyes and dye intermediates. I. G. FARBENIND. A.-G. Brit. 285,382, Feb. 14, 1927. Indophenols and leucoindophenols are obtained from a base, the nucleus N of which belongs to a hydrogenated ring system by condensing it with a quinone haloimide or a *p*-nitrosophenol, or by its simultaneous oxidation with a *p*-amino phenol. *E. g.*, *p*-aminophenol is simultaneously oxidized with hexahydrocarbazole, N-ethylhexahydrocarbazole, tetrahydroquinoline, octahydro-α-naphthoquinoline and with octahydroacaridine and the resulting indophenol is isolated as its leuco deriv. Other examples are given. The products may be used as intermediates in the manuf. of S dyes.

Emulsifying agent for dyes. BRITISH DYESTUFFS CORPORATION LIMITED, JAMES BADDILEY and ERNEST CHAPMAN. Fr. 635,264, May 31, 1927. Mineral oil fractions capable of sulfonation are sulfonated and condensed with an alc. The two operations may be carried out in one. Examples are given of the condensation of sulfonic oils with PrOH and iso-PrOH, and of the use of the products as emulsifying and wetting agents for dyes.

Dyeing. MARTIN BATTEGAY (to Calco Chemical Co.). U. S. 1,686,224, Oct. 2. Fibrous material such as silk, cotton or artificial silk is dyed in a single operation by use of a sulfurized phenol and an acid dye or salt of such a dye, *e. g.*, acid violet 4B, together with Na_2CO_3 or other suitable alkali.

Dyeing. I. G. FARBENIND. A.-G. Brit. 285,442, Feb. 16, 1927. Fast blue dyeings are produced by treating with $CuSO_4$ or other suitable Cu compd. fibers such as cotton dyed with a trisazo dye contg. as first component an aminosalicylic or amino-cresotinic acid or a deriv. and as end component 2-amino-5-naphthol-7-sulfonic acid or a deriv. or substitution product. Examples are given.

Dyeing. JOSEPH NÜSSLEIN (to I. G. Farbenind. A.-G.). U. S. 1,684,881, Sept.

18. Fibrous material such as yarn or fabric is treated with a mixt. comprising aniline or other suitable aromatic amine which is practically insol. in water, together with water and an emulsifying agent such as Na dibutylanilinesulfonate and the amine is then oxidized.

Dyeing. N. N. Vorozhtzov and K. L. Gribov. Russ. 3822, Oct. 31, 1927. Textile materials, furs, feathers, cotton, layers of gelatin, albumin, collodion, etc., are treated with aromatic mono-, di-, or polynitro-, mono-, di-, or polysulfonic acids or their salts and exposed to the action of sunlight.

Dyeing fabrics. Ferdinand Edlinger. Austrian 108,906, Oct. 15, 1927. Fabrics which have been heated and pressed in a patterning calender are treated in a dyebath which is first cold and relatively concd. and later warmed and dild. The pressed and unpressed parts of the fabric are thus differentially dyed.

Dyeing fabrics in a centrifugal apparatus. Tandy A. Bryson and John J. McKeon (to General Laundry Machinery Co.). U. S. 1,687,122, Oct. 9. Mech. features.

Dyeing artificial silk. I. G. Farbenind. A.-G. Brit. 284,652, Feb. 2, 1927. Artificial silk made from cellulose derivs. such as cellulose esters and ethers and their conversion products is dyed with azo dyes contg. not more than one sulfonic or carboxylic group, obtained by coupling diazo compds. with substituted or unsubstituted cyclic compds. comprising a benzene nucleus condensed with a 5-membered heterocyclic ring, of which one H atom can react with the diazo compd. Cyclic compds. which may be employed include β-ketocoumarane, oxindole, hydroxythionaphthene, 3-hydroxy-1-sulfone-naphthene and methylketol, and among other components of dyes mentioned are: sulfanilic acid, 6-chloro-2-toluidine, 2,5-dichloroaniline, aniline-*o*-sulfonic acid. Examples are given for dyeing in various yellow shades.

Dyeing cellulose esters. British Celanese, Ltd., and G. H. Ellis. Brit. 284,376, Oct. 21, 1926. Cellulose formate yarn, cellulose propionate yarn or other yarns, fabrics, films or the like of cellulose esters other than the acetate, are dyed, printed or stenciled by the use of an aq. dispersion of an insol. or "relatively insol." org. coloring matter or compd. prepd. by pretreating the coloring matter with dispersing agents such as NH_4 sulforicinoleate, Na sulfonaphthalenericinoleate or Na sulforicinoleate or xylene and Turkey red oil. Various other substances also may be added. When dyeings are effected by the azoic process, the insol. component is thus dispersed and is applied to the material before or after the other component. Several examples are given.

Dyeing and printing cellulose ethers. H. Dreyfus. Brit. 285,104, Oct. 8, 1926. Yarns, fabrics, films or other products contg. cellulose ethers such as ethylcellulose are dyed printed or stenciled with an aq. dispersion of an insol. or "relatively insol." coloring matter or compd. prepd. by pretreating the coloring matter with a dispersing agent. Numerous examples, details and modifications are given. Cf. *C. A.* **22,** 3051.

Colored films. C. Dreyfus (to British Celanese, Ltd.), and G. H. Ellis. Brit. 285,431, Feb. 16, 1927. Various azo or other suitable coloring substances which are insol. in water are dissolved by use of org. solvents or of solubilizing agents and used in coloring solns. of cellulose esters or ethers during their formation into films or sheets for *photographic* or other purposes. Insol. pigments may also be added to produce opaque effects.

"Mineral dyeing" of textile material. Clarence B. White (to Vivatex Processes, Inc.). U. S. 1,686,540, Oct. 9. A difficultly sol. metallic salt, such as an oxidized product made from $FeSO_4$, is brought into soln. with the aid of a "solvent stimulant" such as formic acid and Ba acetate and this soln. is used to impregnate textile material which may then be treated with alkali or soap to form an insol. compd. in the fiber.

Preparing cellulosic fibers for dyeing. Chemische Fabrik vorm. Sandoz. Brit. 284,358, Jan. 28, 1927. Cotton, mercerized cotton, "viscose silk" or other cellulose fibers are rendered capable of being dyed by acid dyes by treating them simultaneously with a sulfonyl halide and a tertiary org. base. Among the substances which may be used are: the chloride or bromide of any aliphatic or aromatic sulfonic acid with Et_3N, Me_2NPh, C_5H_5N and C_9H_7N. $PhNO_2$ or other inert solvent may be present. Cf. *C. A.* **22,** 2847.

Fixation of basic dyes on cotton fabrics. Ivanovo-Voznesenskii Government Textile Trust. Russ. 4342, Sept. 15, 1924. The goods after being treated with the acetate soln. of the basic dye together with the acetate soln. of the metal salt which forms an insol. hydroxide (*e. g.*, of Al, Cr or Zn) and after steaming, are passed over a hot soln. of any product of phenol or its homologs obtained by boiling an alk. phenol soln. with S.

Applying dye solutions to yarn on bobbins. James S. Johnston (to Eclipse Tex-

tile Devices, Inc.). U. S. reissue 17,096, Oct. 2. See original pat. 1,613,707 (*C. A.* **21,** 827).

Mordanting cellulose derivatives. CAMILLE DREYFUS, GEORGE RIVAT and ERNEST CADGENE. Fr. 636,058, June 16, 1927. Cloth or the like cellulose derivs., such as acetate, is treated with one or more mordanting salts and one or more swelling agents. Acetates or other salts of Cr, Al or Fe are used as mordanting agents, and formic acid, AcOH, furfurol, phenol, pyridine, or aq. solns. contg. furfural, and either AcOH or formic acid are used as swelling agents.

Mordanting cellulose derivatives. CAMILLE DREYFUS, GEORGE RIVAT and ERNEST CADGENE. Fr. 636,057, June 16, 1927. Cloth or the like contg. cellulose derivs. such as acetate is treated with a concd. soln. (40–55%) of Fe salts, particularly the chloride, sulfate or nitrate. The cloth is then dyed with mordant dyes.

Printing textile materials. J. G. KERN and C. J. SALA (to E. I. DuPont de Nemours & Co.). Brit. 285,041, Feb. 9, 1927. Vat dyes are pasted with a dispersing agent, preferably glycerol, and ethanolamine (which may be a crude product obtained by distg. the reaction products of ethylene oxide and NH_3).

Color printing cloth. ÉTABLISSEMENTS PETITDIDIER (ANCIENNE MAISON JOLLY-BELIN). Fr. 32,658, May 7, 1926 Addn. to 615,301. Cloth having a basis of silk or wool is passed, after printing the cellulose acetate, into a bath of $KMnO_4$ and then into a soln. of $NaHSO_3$ to remove the color, arising from the printing, from the basis of the cloth.

Wetting out and dyeing or other treatments of fibrous materials, leather, etc. RAINER H. POTT (to Chemische Fabrik Pott & Co.). U. S. 1,686,836, Oct. 9, Sulfonic acid salts of isopropylnaphthalene or other sulfonic acid salts of substituted aromatic polynuclear hydrocarbons are added to acid fiber-treating baths such as are used in carbonization of woolen fabrics or in dyeing. Cf. *C. A.* **21,** 826.

Carbonizing woolen fibers. RAINER H. POTT (to Chemische Fabrik Pott & Co.). U. S. 1,686,837, Oct. 9. An acid bath is used in the presence of sulfonic acid salts of isopropylnaphthalene or other suitable sulfonic acids of substituted aromatic polynuclear hydrocarbons which serve to improve the uniformity of penetration of the treating liquid.

Treatment of fibrous materials. DOUGLAS MCINTYRE PROCTOR and THE CARBORUNDUM COMPANY. Fr. 635,324, May 31, 1927. Rollers for drawing or otherwise treating fibrous materials are covered with a layer of hard material such as SiC or fused Al_2O_3 and a binder such as a silicate, gum lac or vulcanite.

Disintegrating vegetable fibers. I. G. FARBENIND. A.-G. Fr. 635,302, May 20, 1927. Vegetable fibers are treated with a soln. of an agent capable of decomposing the fat, *e. g.*, dibutylnaphthalenesulfonic acid or one of its salts. An emulsifying agent may be added.

Textile fibers from skins of sharks, etc. A. EHRENREICH. Brit. 284,297, Jan. 27, 1927. The skin is subjected to the action of an enzyme such as trypsin to disintegrate the intercellular substance, is then tanned and the fibers are sepd. by carding and opening machines. Various details are given.

Impregnation of vegetable fibers to prevent rotting. S. E. PISAREV. Russ. 4547, Sept. 15, 1924. Fibers are impregnated with Cu salts of naphthenic acids in an aq. soln. of ammonia or in an aq. ammonia soln. of Cu oxide.

Impregnation of vegetable fiber, netting, etc., to prevent rotting. S. E. PISAREV. Russ. 4,548, Sept. 15, 1924. Fibers, etc., are impregnated by pressing in a suspension of basic Cu carbonate in water and CO_2 followed by drying to dispose of the CO_2.

Processing fabrics. CHARLES F. RYLEY (to Henry Dreyfus). Can. 283,818, Oct. 2, 1928. Sizes, oils or other dressings are removed from woven or knitted fabrics consisting wholly or partly of cellulose acetate, by winding the fabric on a perforated pipe and causing benzene, xylene or other org. solvent to percolate outwardly through the roll under a relatively small pressure.

Treating fabrics to render them less likely to develop faults. GEORGE H. ELLIS (to Celanese Corp. of America). U. S. 1,686,149, Oct. 2. Fabrics such as those of cellulose acetate are treated with strong aq. solns. of dispersing agents, *e. g.*, sulfonated fatty acids or sulfonated derivs. This treatment serves to prevent development of various faults.

Apparatus for drying web material. WILHELM BOCK. U. S. 1,686,597, Oct. 9.

Degreasing textiles. I. G. FARBENIND. A.-G. & Fr. 635,456, June 2, 1927. Ethylene chloride is used for degreasing textiles. Cf. *C. A.* **22,** 3789.

Machine for soaking textiles. CORNEILLE LONGTON. Fr. 635,659, April 6, 1927.

never fell below 97. When burned cane is being milled, condensate water should be used for purging. J. F. BREWSTER

Factors influencing the filtration of raw sugar solutions. R. H. KING. *Planter and Sugar Mfr.* **79,** 221(1927).—A readily filtering sugar demands good clarification in its manuf., the P_2O_5 content of the juice being the major factor in securing this. Suspensions which impede filtration are the result of poor defecation, soly. of certain substances, which are pptd. by concn. in the clarified juice, re-soln. of the settlings during washing, and also the introduction of insol. matter from the low-grade sugar remelted. Suspensions capable of forming ppts. that retard filtration are formed as the result of the digestion of fine bagasse particles during treatment with CaO at high temp. B. C. A.

An apparatus for determining the activity of filtering or decolorizing matter in technical laboratories. ALEŠ LINSBAUER AND JOZEF VAŠÁTKO. *Listy Cukrovar.* **46,** 659–63(1928).—A description of the app., its operation and application in refineries is given. FRANK MARESH

The decrease of economic losses in the diffusion of sugars. FR. PAULÍK. *Listy Cukrovar.* **46,** 647–50(1928).—A descriptive article concerning the com. operation of batteries of diffusion cells in operation since 1909. FRANK MARESH

The future sugar diffusion conducted with respect to density. ALOIS RAK. *Listy Cukrovar.* **46,** 666(1928).—A plea is made for progress in continental diffusion cells involving the principle of keeping both reacting media in the individual diffusion chambers in continuous and progressive motion in the direction of their changing densities and transferring them so that each one shall enter the diffusion cell by itself. FRANK MARESH

The effect of heating on the specific conductance of sugar solutions. L. SATTLER AND F. W. ZERBAN. *Facts About Sugar* **23,** 686–9, 713–5(1928).—In mildly acid solns. comparable to those occurring in the factory, inversion of sucrose induced by heating in the presence of certain salts causes a decrease in the cond., principally on account of the increase in total solids. With reducing sugars, there is usually observed a slight destruction of sugar and an increase in cond. This increase is particularly marked in the presence of amino acids. All this applies to solns. around 40 Bx. With solns. around 5 Bx. or less, the observed changes are much smaller and in the opposite direction. When the solns. are initially alk. the heating causes a large destruction of invert sugar with consequent large increase in cond.; even with sucrose a distinct increase in cond. takes place. J. F. BREWSTER

Apropros the electrolysis of sugar juices. JULIEN BERGÉ. *Sucr. Belge* **47,** 283–5, 302–4(1928).—The Say-Gramme method for purification of sugar juices consists of electrodialysis using Fe electrodes. One chamber becomes alk., the other acid, which dissolves the Fe electrode, forming $FeSO_4$. Part of the org. matter ppts. in the central juice chamber and part in the membranes. The current is reversed and the $FeSO_4$ and KOH react in the central chamber, producing a flocculent ppt. of $Fe(OH)_2$, resulting in beautiful defecation. The current requirement is 1.25 kw. hrs. per ton of beets. Fe consumed is proportional to current consumption. The life of the parchment membranes depends on the rapidity of obstruction and the care in handling and cleaning. Improvements required are: Employment of durable dialyzing membranes and sol. electrodes of low-cost material, or which can be regenerated. Their salts must be non-poisonous. E. A. FIEGER

Hydrogen-ion concentration and the defecation of cane juice. H. S. PAINE AND R. T. BALCH. *Planter and Sugar Mfr.* **79,** 127–32, 148–50(1927); cf. *C. A.* **21,** 2570.—To ensure a max. clarification and to prevent inversion losses the juice should be limed (provided that sufficient filtering capacity be available) to p_H 8–9, measured either before or after heating, but the H-ion concn. for max. defecation varies with different juices, and in any case the possibilities of color formation and of scaling of evaporator tubes and heaters are to be considered. B. C. A.

Balancing total soluble solids. E. E. BATTELLE. *Facts About Sugar* **23,** 302–3 (1928); cf. *C. A.* **22,** 2678.—The adoption by cane sugar manufacturers of a system of reports which will include a balance of total sol. solids received in cane is urged as of great tech. importance in that it may disclose and correct losses not apparent in the present scheme of lab. reports. Tabulated data and discussion are given. J. F. BREWSTER

Reducing sugars in raw sugars. F. W. ZERBAN AND WM. J. HUGHES. *Sugar* **30,** 56–7(1928).—By applying Browne's correction formula (cf. *C. A.* **14,** 1057) $S/[G + 40 + (3S^2/1000G^2)]$, where S is mg. sucrose by Clerget, G the uncorrected mg. of glucose corresponding to wt. of reduced Cu to Allihn's table for dextrose and then multiplying

by the reducing ratio 1.044 to convert dextrose into invert sugar a set of tables and a set of graphs are presented from which the % of invert sugars corresponding to mg. reduced Cu may be read directly. A single graph upon a very large scale is constructed for each % sucrose content from 94 to 98%. J. F. BREWSTER

Abnormal color of raw sugar. K. ŠANDERA AND A. RŮŽIČKA. *Listy Cukrovar.* **46,** 561–4(1928).—For many years, sugar from N. W. Bohemia has had an ash gray color instead of a normal yellow. The malady is regional and has been noticed to be assocd. with areas frequented by hail. The juices show a lowered alky. and a green color. Submitted samples showed a low ash content. From cond. titration curves, the compn. of the sugar and non-sugars was judged to be the same. The absorption spectrum of the abnormal sugar showed a lessened absorption in the violet and blue, resembling that of Lundén's "amethyst color." The coloring matter is adsorbed by the sugar crystals during crystn., giving rise to colors in the product, but not any of the coloring matter remains in the molasses. FRANK MARESH

Acetic acid method for recovery of sugar from molasses (procedure of Friedrich and Rajtora). F. MIZZACTROLI, I. MUTTI AND A. PROMBO. *Sucr. Belge.* **47,** 321–8 (1928).—The method consists of concn. of molasses, addn. of AcOH and C_6H_6, sepn. of AcOH of the mother liquor and working up of the non-sugar. The concn. of molasses prevents diln. of the AcOH and also soln. (in part) of the sugar after pptn. The C_6H_6 is added to reduce the viscosity. A study was made of the influence of C_6H_6, AcOH and temp. upon yield of sugar obtained. The best conditions are: Brix 90–95°, glacial AcOH 60%, C_6H_6 5%, and temp. 50–60°. The work confirms that of Friedrich and Rajtora (cf. *C. A.* **19,** 743). E. A. FIEGER

Graphic method for the control of cane sugar factories. M. O. GIROL. *Bull. assoc. chem. sucr. dist.* **45,** 391–5(1928).—A graphic method is briefly described whereby one may tell at a glance the extn. of the mills and the amt. of imbibition water added. All the data necessary are: brix of various mill juices, brix of mixed juice and quantity of mixed juice. The graphs from day to day have relative significance and give handy and easily pictured information. The purity of last mill juice should be recorded as it serves as a means of knowing whether much sugar is being lost in the bagasse, and also of giving an insight as to how well the imbibition water is mixed with the cane juice. E. A. FIEGER

The analysis of normal cane juice. E. E. DOMINGUEZ. *Facts About Sugar* **23,** 206–8(1928).—Indirect methods and formulas are discussed. In the proposed method it is required that the wts. of cane, mixed juice and maceration H_2O be positively known. The chem. data required are analysis of mixed juice, residual juice and bagasse. Details of calcn. should be obtained from the original paper. J. F. BREWSTER

Notes on the p_H of cane juice. R. T. BALCH. *Sugar* **30,** 8–9(1928).—At a Porto Rican central in 1927, the av. p_H of all samples was found to be 5.06, ranging from 4.97 to 5.13 for fertilized plots and from 4.99 to 5.12 for control plots. One would expect the p_H of crusher juices to be practically const. in any one factory, and any abnormal lowering of the value to be an indication of cane deterioration after cutting. J. F. BREWSTER

Spain's cane-sugar industry. J. VAN HARREVELD. *Indische Mercuur* July 25, 1928; *Facts About Sugar* **23,** 882–3(1928).—H. gives the name, daily capacity (which varies between 50 and 250 metric tons), ownership and location of each factory. The method of paying for the cane, equipment of the factories, and forms of products are briefly described. M. J. PROFFITT

Progress in cane-sugar agriculture. H. P. AGEE. *Facts About Sugar* **23,** 946–7, 951(1928).—A general discussion of Hawaiian investigations on new cane varieties, new *fertilizers* and *fertilization practice,* new practices in irrigation, the relative merits of long and short cropping, and the planning and execution of exptl. work in the fields. M. J. PROFFITT

The value of measuring growth of cane. H. J. RODRIGUES. *Planter and Sugar Mfr.* **80,** 21–2(1928).—Following the Javan practice, height of growth of cane in Louisiana over varying time periods was measured and the procedure is recommended as enabling overseers to check growth conditions such as fitness, fertilizing and tillage of soil and weather conditions. J. F. BREWSTER

Deterioration of sugar content in P. O. J. canes. G. B. SARTORIS. *Facts About Sugar* **23,** 662–5(1928).—By experimenting with 4 P. O. J. varieties in Louisiana it was found that the cane withstands the av. winter conditions, and that it is better to allow it to stand until it can be cut rather than to windrow. In the warm weather of early harvest the time from cutting to grinding should not exceed 4 days. When the cane has been frosted there is no appreciable loss 10 days after cutting. Cane

burnt standing did not deteriorate rapidly during cool weather. No expts. were made with burnt cane in warm weather. J. F. BREWSTER

Experiments in the harvesting of burned cane. H. H. DODDS AND P. FOWLIE. *Planter and Sugar Mfr.* **81**, 184–5(1928); *Facts About Sugar* **23**, 594–5(1928).—Cane left standing after burning suffers no deterioration for 9 days but thereafter shows slow, gradual diminution in sucrose and purity. With hand-trashed cane deterioration sets in at a uniform rate from the time of harvest. The above are exptl. results obtained in Natal. J. F. BREWSTER

Revolving knives and shredders. FRANCIS MAXWELL. *Facts About Sugar* **23**, 90–1(1928).—Summarizing, M. states that (1) where cane is mechanically unloaded to the carrier, knives and shredders are used in supplementary combination. (2) Either 1 or 2 sets of knives may be used, but for levelling purposes only to prep. the cane for the crusher. (3) A shredder of modern type is essential to achieve economically the max. extn. by the milling plant. (4) When cane is loaded on the carrier in regular layers by hand, the advantages gained from levelling by knives are not balanced by the gain in capacity. J. F. BREWSTER

Revolving knives and shredders in the cane sugar mill. THEO. NICHELSEN. *Planter and Sugar Mfr.* **80**, 22–3(1928).—N. discusses the value of knives in prepg. cane for the mill and the effect of shredding upon extn. in the Philippines. J. F. B.

The cold water treatment. T. E. HOLLOWAY. *Facts About Sugar* **23**, 907(1928).—H. acknowledges the priority of Cleare in recommending this method of treating seed cane. M. J. PROFFITT

The dilution problem. E. M. COPP. *Facts About Sugar* **23**, 280–4(1928).—**Bagasse and maceration per cent cane.** *Ibid* 326–9.—These 2 articles bear upon sugar house control calcns. J. F. BREWSTER

A maceration efficiency factor. E. M. COPP. *Facts About Sugar* **23**, 350–1 (1928); cf. preceding abstracts.—The efficiency of admixt. of maceration water is discussed from the standpoint of replacement of residual juice in the fiber by water. The *maceration efficiency factor* = [(100 − fiber in bagasse)/(100 × fiber in bagasse)] × [1 − (diln. % cane)/maceration % cane)]. J. F. BREWSTER

The removal of gums from cane juices. MAURICE BIRD. *Facts About Sugar* **23**, 139(1928); *Planter and Sugar Mfr.* **80**, 143–4; cf. *C. A.* **22**, 2679.—Comparative data are given on treatment of juices by "superheat" (115°), followed by liming, by cold liming in the usual way, and by treatment with Na_2HPO_4 followed by liming in the usual manner. The gums were detd. by pptn. with alc. as usual. Apparently more gums are removed by the "superheat" combined with Na_2HPO_4 treatment, but some are already removed by heat alone. The "superheat" treatment on a large scale over a no. of years has given excellent results in raw sugar manuf. J. F. BREWSTER

The ratios of ash constituents in different cane varieties. C. E. COATES, E. A. FIEGER AND L. G. SALAZAR. *Planter and Sugar Mfr.* **80**, 421–2(1928)—Four varieties of Louisiana sugar canes were analyzed for moisture, ash, N and ash constituents. The results are tabulated. Tables are given showing content of K_2O and P_2O_5 as % ash and as % dry wt., also ratios of sugar to K_2O and to P_2O_5 in dry matter. J. F. BREWSTER

Moist storage of commercial sugar beets. JEAN A. PACK. *Facts About Sugar* **23**, 378–9(1928).—To reduce the sugar loss of com. beets to a practical min., the beets should retain their normal wt. throughout the storage period. Field piles, silos, rapid transportation, large piles, etc., are of value insofar as they help to maintain the normal moisture requirements. The fundamental importance of moist storage should be recognized. J. F. BREWSTER

The present state of the problem of beet drying. K. ŠANDERA. *Listy Cukrovar.* **47**, 1–6(1928).—A review. FRANK MARESH

Cost of drying beet cossettes. ANON. *Facts About Sugar* **23**, 830–1(1928).—An advanced abstract of a report to be published by the Inst. Eng. of Oxford Univ. The cost of producing a ton of sugar by the Oxford modification of the De Vecchis process in the Eynsham factory with a capacity of 25,000 tons annually (105 days drying cossettes and 224 days extg. the dried cossettes) has been found to be £7 18s 3.98d; in a self-contained factory of 100,000 tons capacity annually, it is computed that the cost per ton should be but £3 18s 3d, and for an organism of drying stations supplying a large factory the cost should be still less. Capital charges are not indicated as included. M. J. PROFFITT

Desiccation of sugar beet and the extraction of sugar. B. J. OWEN. *Rept. Ministry Agr.* **1927**, 84 pp.—A full report is given of an investigation into the De Vecchis process (*C. A.* **18**, 1761) carried out at Eynsham. The conditions necessary for drying

beet cossettes were examd., first in lab. expts. and then in 3 types of driers, *viz.*, (*a*) a cylindrical mass drier similar in principle to that of Brit. 235,273; (*b*) a moving-belt drier of the type used by De Vecchis, and (*c*) a tray drier with 3 hot-air compartments, one perforated tray with cossettes being placed over the 1st, another over the 2nd and 2 over the 3rd, these positions representing successive stages of drying. Among the factors studied were the practicable thickness of the cossette layer (8–12 in.), the reduction in bulk (about 50%) and in resistance to air during drying, and the varying sensitiveness of the sugar to high temps. at different stages of drying. It was completely established that the drying can be carried out on a large scale without inversion of sugar or caramelization. So long as the cossettes were moist the temp. of the applied air (38–127°) had no effect on the sugar, but loss of sugar occurred from the use of high temps. (above 113°) on cossettes having a moisture content below 20%. It was accordingly considered inadvisable to continue heating after the moisture was expelled, no benefit being found to result from the prolonged heating advocated by De Vecchis for the coagulation of proteins. The drying process could thus be completed in less than 1 hr. The tray drier was adopted for most of the work as being easy to manipulate and control. Cossettes containing 3–5% of moisture suffered no deterioration on storage; after long exposure to the air the moisture content rose to 11–13%, but not beyond, and in large piles only the outermost layers of cossettes (to a depth of about 6 in.) lost their original crispness. Extn. of the dried cossettes in a battery of small diffusion vessels, each provided with a calorisator for heating the juice passing from one vessel to the next, yielded juices of 45–50° Brix with purities of about 90%. These thick juices had excellent phys. characteristics, being light in color and clear, and not darkening perceptibly on exposure to air. The difficulty experienced in obtaining gravities above 50° Brix, together with microscopical evidence and osmotic expts., led to the conclusion that the cells of the beets are not ruptured by the drying process, and that the subsequent extn. of the sugar is an osmotic phenomenon as in the case of fresh beets. A continuous diffuser in the form of a vertical cylinder with a helical conveyor to raise the cossettes against the descending juice (cf. *C. A.* **21**, 2198) was also used successfully for the extn. of the sugar. Serious filtration difficulties were experienced with De Vecchis' method of purifying the juice with lime and superphosphate. Satisfactory working was attained, however, by a mech. removal of suspended impurities in a centrifugal clarifier, either before or after liming, the ppt. produced by superphosphate being then easily filterable. The color of the purified juice can, if necessary, be further improved by treatment with active carbons. Without the latter treatment, however, a strike of white sugar could be obtained from the juice reinforced by a proportion of second-product sugar. The amt. of effluent from flumes and beet washing is, of course, the same for the desiccation process as for the diffusion process, but that from the working of the cossettes is less for the former than the latter, and would in a normal desiccation factory be distributed over a long working period. An appendix dealing with beet-factory effluents describes a revolving double screen by which the coarse and finer suspended matters can be separately removed from the waste waters from flumes and washers, and some suggestions are made for the treatment of process affluent. B. C. A.

Natural alkalinity [of beet juices]. O. Spengler and C. Brendel. *Z. Ver. deut. Zucker-Ind.* **1927**, 801–16.—By the natural alky. of beet juice is understood the residual alky. after treatment with lime and pptn. of this by CO_2; it represents free potash and soda originally present as salts. The greater part of the alkali metals in fresh juice from sound beets is combined with acids which are precipitable by lime. In carbonatation, therefore, it is not necessary to leave any free lime to supply the requisite final alky., the liberated potash and soda sufficing for this. These are present as hydroxides at the end of the first carbonatation, and should be converted into carbonates, but not into bicarbonates, by the second. In old or damaged beets the alkali metals are combined with acids which are not precipitable by lime, and they remain as neutral salts after carbonatation, so that there is a deficiency of natural alky., and it becomes necessary to leave some free lime after carbonatation to obtain the necessary final alky. To avoid this, since lime alky. is particularly undesirable during evapn., a suitable amt. of Na_2CO_3 may be added to the juice, *e. g.*, before the final carbonatation. As a guide in ascertaining how much to add, the authors describe methods for detg. the "theoretical" and the "practical" residual alky. on filtered juice from the first carbonatation. The "theoretical" residual affinity is the excess of the total alky. (to phenolphthalein) over the lime content (detd. by soap soln.), both being expressed as CaO. Probably, however, the "practical" residual alky. will afford a closer estimate of the condition of the juice after the final carbonatation. It is found by neutralizing

to phenolphthalein with 0.2*N* HCl, then adding an equal vol. of 0.2*N* Na_2CO_3, heating in boiling water, filtering from $CaCO_3$, cooling, and detg. the residual alky. with 0.0357*N* HCl. Full working details and precautions are given. Factory experience alone can decide which of these methods is the more useful. B. C. A.

Removal of phosphoric acid from beet juice during liming and saturation. O. Spengler and A. Traegel. *Z. Ver. deut. Zucker-Ind.* **1928,** No. 859, 190-8.—In a certain beet sugar factory, the sight glasses of the evaporators were rapidly fogged, transparency being lost within a few hrs. after cleaning. This condition was very irregular and had not been observed in the past 20 years. Analysis showed that the hard deposit consisted of about 65% $Ca_3(PO_4)_2$, the remainder being $CaCO_3$. In only one factory were these high phosphate deposits found, that factory using H_3PO_4 in the battery to overcome other troubles. H_3PO_4 is always present in beet juice. *Conclusions:* (1) The sepn. of H_3PO_4 during clarification is greater with increased use of lime. While Pachlopnik (*C. A.* 20, 2592) obtained complete removal of phosphoric acid in sugar solns. by treatment with 3.3% CaO, the authors pptd. 98.4%, 96.1% and 94.8% of the phosphoric acid by the use of 3%, 2% and 1.5% CaO, resp. (2) During satn. a part of the H_3PO_4 remaining in soln. is carried down by the $CaCO_3$ ppt. (3) The degree of satn. influences the quantity of H_3PO_4 remaining in or going into soln. again. (4) Satn. to an alky. of 0.018 to 0.01% CaO is most favorable for the removal of the H_3PO_4. With juice treated with 2.5% CaO and satd. to an alky. of 0.018% CaO only 0.3% of the H_3PO_4 originally present in the diffusion juice remains in soln. (5) On further satn. or supersatn., H_3PO_4 is again dissolved. E. A. Fieger

Surface tension and adsorbents. J. Dědek and J. Nováček. *Sugar* **30,** 99-101, 149-51, 199-200, 247-8(1928).—Detns. of surface tension and viscosity measurements were made on all products of beet sugar factories from diffusion juices to finished sugars and molasses and the results are shown in tables and graphs. The influence of carbonation, sulfitation and treatment with decolorizing carbon are followed through the factory and the action of electrolytes, p_H, and impurities upon the surface tension of sugar liquors is discussed. J. F. Brewster

The disposal of effluents from sugar-beet factories. A. J. V. Underwood. *Ind. Chemist* **3,** 260-7(1927); *Pub. Health Repts.* **43,** 2354(1928).—The manuf. of beet sugar is limited to about 3 months of the yr. and a heavier charge is thus thrown on the cost of production for a given capital expenditure than is the case in industries which are employed throughout the year. This consideration assumes especial importance in view of the large quantities of H_2O used and waste produced in the manuf. of beet sugar. The location of beet-sugar factories in agricultural districts and on streams of comparative purity renders any contamination of the stream more noticeable and more significant than that which has already reached a high degree of pollution. During the early part of the period for which the sugar factory is working, the flow of many streams is low, and this may require greater storage facilities for the effluent or a higher degree of purity. The lower temps. at this time of the yr. also affect adversely the activity of bacteria and the efficiency of biological methods of purification. In extreme cases, where a stream is frozen over, further difficulties are introduced, since it has been shown that in such cases the dissolved O content of an unpolluted stream may fall to as low as 40% of satn. Four different wastes are produced by beet-sugar factories. Beet carrying and washing H_2O, amounting to about 2 m. g. d. per 1000 tons of beets treated daily, is the least objectionable, contg. some suspended mineral matter and ordinarily but 20 to 50 p. p. m. sugar, and having an O consuming value of about 340 p. p. m. This is treated successfully by plain sedimentation for 6 to 8 hrs. and by pptn. with lime. Diffuser battery and pulp press waters, together amounting to 300,000 g. p. d. per 1000 tons of beets, are more objectionable and more difficult to treat. Combined, these carry 0.6% of sugar and an equal amt. of other org. matter. Among methods used with some success in treating these are: addn. of lime, followed by carbonation, with or without the mixing in of beet carrying and washing H_2O; plain sedimentation and land irrigation; septic tanks with or without the use of lime; contact beds; trickling filters; fermentation with or without lime to neutralize the butyric acid formed; and activated sludge. Each process has definite limitations. Filter-press lime sludge is readily disposed of by application to land, preferably treated previously with quicklime. Steffens waste water, the production of which is limited to the United States, is quite objectionable, having an O-consuming power of 3000 p. p. m. and containing all the mineral salts of the beets which may be toxic to fish. C. R. Fellers

Sugaring out of molasses in the American beet-sugar industry. Emanuel Šlechta. *Chem. Obzor* **2,** 259-62; *Chem. Zentr.* **1927,** II, 2478.—Processes ordinarily used in America for the recovery of sugar from molasses are discussed, with special reference

to the plant of the Great Western Sugar Co. which uses the new baryta process.
C. C. Davis

A loader for sugar beets and loose materials. Ladislav Rychetský. *Listy Cukrovar.* **46,** 566–8(1928). A description and tables comparing costs of operating with hand labor and loader. Frank Maresh.

The composition of German molasses during the season of 1926–1927. Drews. *Z. Spiritusind.* **51,** 96(1928).—Analyses of molasses are given. C. N. Frey

Extraction of sucrose from carobs. Guiseppe Oddo. Univ. de Palerme. *Chimie et industrie* **20,** 207–15(1928); cf. *C. A.* **22,** 2285.—A discussion of the economic advantages of the production of sucrose from carobs, as compared with sugar cane and beets. All attempts to produce sucrose from carobs by diffusion or extn. with H_2O have failed; but it readily crystallizes from the EtOH or MeOH ext., and this process is proposed for its com. manuf. A. Papineau-Couture

The saccharification of wood waste. E. Hägglund. *Papierfabr.* **25,** Tech.-Wiss. Teil 52–60(1927).—An address covering the historical aspects of cellulose saccharification. A com. plant for the utilization of wood waste by the patented Goldschmidt process is described. J. L. Parsons

The ternary system: strontium oxide-sucrose-water. W. Reinders and A. Klinkenberg. Tech. Hochschule, Delft. *Z. Elektrochem.* **34,** 406–7(1928).—A criticism of the article by Grube and Nussbaum (cf. *C. A.* **22,** 1870). R. and K. take exception to G. and N.'s paper on 3 points: (1) The soly. of $Sr(OH)_2.8H_2O$ is raised by addn. of sugar instead of lowered as G. and N. assert. (2) According to G. and N.'s figures the compn. of the soln. in equil. at 100° with $Sr(OH)_2.8H_2O$ and sucrose is 21% SrO and 11% sugar. R. and K. find the triple point of the system $Sr(OH)_2$-disaccharide-soln. at 70° and with 0.1% sugar in soln. (3) G. and N. find the soly. of sugar greatly decreased by the addn. of small quantities of SrO. R. and K. find that addn. of SrO raises the soly. of sugar very slightly. A full account of the work is promised. R. E. Gibson

The utilization of bagasse in the production of alcohol. I. II. Henry Arnstein. *Planter and Sugar Mfr.* **81,** 121–4, 143–4(1928).—A review is given of the prepn. of fermentable sugars and alc. from cellulose material and similar expts. of A. on bagasse fiber. J. F. Brewster

Tests with a new mechanical bagasse stoker. I. Hes and H. J. Spoelstra. *Arch. Suikerind.* **36,** III; *Mededeel. Proefsta. Java-Suikerind.* 821–42(1928).—A new bagasse stoker, installed at the Gayam mill (Java), and in full operation, is described and illustrated. The results are satisfactory, little attention is required, and the combustion is improved. P. R. Pekelharing

Electrometric determination of the ash of sugar-factory products. O. Spengler and F. Tödt. *Z. Ver. deut. Zucker-Ind.* **1928,** 1–12.—Electrometric ash detns. on raw sugars are best made on solns. of 5° Brix, for although errors due to small variations in sugar concn. are least in solns. of about 30° Brix, the results obtained at this concn. are liable to deviate much more widely from the results by incineration than those obtained with 5% solns., the conds. of the individual salts present being affected to different extents by high concns. of sugar. In general, the influence of the cond. of the water used is depressed in the presence of the sugar and its salts. Zerban and Sattler (*C. A.* **21,** 2394) found that water of very low cond., 3×10^{-6}, exerted its full influence, but water of cond. 40×10^{-6} contributed only 27.4×10^{-6} to the cond. of 5% raw cane-sugar solns. The factor C representing the ratio between cond. and ash content (by incineration) was found by Zerban and Sattler to range from 1476 to 2022 for cane sugars of various origin in 5% solns. For sugars from the same district it was fairly const., being 1786 on the av. for Cuban, and 1560 for British West Indian sugars. For 50 raw beet sugars tested by Kayser (*C. A.* **21,** 1560) it ranged from 1680 to 1880. According to Lundén (*C. A.* **21,** 2569) it is lower for beet factory products than for refinery (*i. e.*, affined) beet products; and, in general, as the authors have confirmed, there is an inverse relation between C and the quality of beet products. A high value of C is assocd. with a high ratio of org. to inorg. salts, which indicates inferior quality. For raw cane sugars Zerban and Sattler found that if k is the sp. cond. of a filtered soln. contg. 10 g. of sample in 200 cc., and k_1 that for a similar soln. contg. also 5 cc. of 0.25 N HCl, the ash content is given by the formula: $0.0001757(9.13k + 1935 - k_1)$. The results show much more uniform agreement with incineration results than when a single electrometric factor is used. By this formula variations in the amt. of org. salts present are largely compensated, since they correspondingly lessen the value of k_1 by the replacement of part of the added mineral acid by feebly dissocd. org. acids.
B. C. A.

Sugar-ash bridge. Anon. *J. Sci. Instruments* **5**, No. 9, 296–7(1928).—Announcement of the new Leeds & Northrup a. c. wheatstone bridge for the detn. of the sol. ash of sugar or sugar products together with directions for its use. Current of com. frequencies is used. J. H. Perry

Adsorption in thick juice by layers of carbon. T. Dědek and B. Tumova. *Z. Zuckerind. cechoslov. Rep.* **52**, 65–75(1927).—Beet thick juice and melted raw beet sugar were filtered through layers of various thickness of washed and dried carboraffin, Norit and powd. bone char. Degree of adsorption of color, N, CaO and sulfate ash, and their reversibility as expressed by their occurrence in sweet water, were detd. from analysis of original and treated liquors, chars and the sweet waters. The retention power is highest for color: carboraffin, followed by Norit and bone char. For N: Norit, carboraffin, bone char. For CaO: bone char, carboraffin, Norit. For ash the data are inconclusive. The coloring matter of raw sugar is more easily adsorbed than that of thick juice, probably because of a change in dispersion due to addnl. boiling. As filtration progresses the gradual displacement of matter already adsorbed takes place. On account of the uneven permeability of the layer a study of the adsorption laws could not be undertaken. Slowing down the rate of flow during filtration becomes the greater the thicker is the layer of char. F. R. Bachler

The extraction of anhydrous molasses with organic solvents. R. Vyskočil. *Z. Zuckerind. cechoslov. Rep.* **52**, 77–88, 89–98(1927).—Desugarization of beet molasses with 11 different org. solvents, and rate of removal of nitrogenous matter and other nonsugars were studied with molasses that was dehydrated on strips of filter paper. Figures refer to % substance in original molasses. *AcOH* removed nearly all color, ash and N. Recovered: 41.6 of Clerget sugar of 86.5 true purity. *MeOH* removed 25.26 ash, 56.91 total N, 79.50 betaine N, 20.85 color. Recovered: 81.23 Clerget sugar of 74.08 true purity. *Alc.* removed 41.03 ash, 61.1 total N, 75.83 betaine N, 13.23 color. Recovered: 84.71 Clerget sugar of 72.18 true purity. *Am alc.* recovered, depending on time, temp. and moisture in molasses, 0.91–3.93 dry substance, little more than $^1/_2$ of which is betaine N, representing $^1/_4$ of total betaine N of original molasses. *Et_2O* removed 0.23 dry substance consisting principally of fat. *Acetone*, cold, removed 0.65, hot 1.43 dry substance with 0.24 fat. *Chloroform* removed 0.21 dry substance contg. 3.12 ash, 1–12 N, and the rest fats and soaps. *Benzene* removed 0.25% dry substance, principally fat. *Aniline* was practically inert. *Phenol*, anhydrous, removed from anhydrous molasses 69.75 ash, 88.67 total N, 95.92 betaine N, 27.46 color. Recovered: 44.65 Clerget sugar of 69.4 true purity. Phenol, satd. with H_2O, removed from wet molasses 82.85 ash, 93.45 total N, 98.08 betaine N, 70.35 color. Recovered: 22.98 Clerget sugar of 78.91 true purity. *Pyridine* removed 2.42 dry substance with only 0.36 total N and 0.21 betaine N. It is intended to apply phenol as a means for the isolation of betaine. Former expts. with anhydrous molasses on strips of filter paper were repeated with wet molasses and the most promising solvents and mixts. thereof. Figures refer to % substance in original molasses. 180 g. mol. + 500 cc. MeOH, $^1/_2$ hr. with stirring, went into soln. The insol. residue was 4.68% on dry substance with 25% of original color. 150 g. mol. + 500 cc. 96% EtOH, 1 hr. with stirring, extd. 20.28 dry substance, 15.04 Clerget sugar of 47.91 purity, 14.7 ash, 32.19 total N, 45.22 betaine N, 8.66 color. Residue: 84.96 Clerget sugar of 68.63 purity. 170 g. mol. + 360 cc. AmOH extd. 0.41 dry substance, 0.19 sugar, 0.28 ash, 2.79 total N, 2.28 betaine N. With increasing mol. wt. of alc. soly. of mol. constituents falls, but extn. of N rises. 168 g. mol. + 500 cc. acetone in 3 hrs., removed 1.16 total N. 500 g. mol. + 500 g. phenol after 1 week gave a lower layer contg. many large, dark sugar crystals and sirup contg. 61.21 Clerget sugar of 63.38 purity and an upper layer consisting of phenol ext. contg. 40.61 dry substance, 38.79 Clerget sugar of 63.39 purity, 49.88 ash, 60.12 total N, 67.35 betaine N, 31.20 color. Isolation of betaine with HCl and freezing failed. Sugar crystals freed from phenol with benzene had 93.02 direct polarization, 91.99 Clerget polarization, 1.67 ash, 0.20 total N. Benzene-AcOH mixt. yielded 65% nearly white sugar of 98.79 direct and 97.61 Clerget polarization, 0.25 ash, 0.03 total N. Phenol-AcOH mixt. gave 55% nearly white sugar of 98.43 polarization, 0.01 ash. One kg. mol. + 1.5 l. H_2O + 1.5 kg. phenol gave an ext. contg. 10.55 Clerget sugar of 32.31 purity, 13.15 ash, 72.6 total N, 97.68 betaine N and a residue contg. 89.45 Clerget sugar of 73.41 purity, which later yielded 18.46 raw sugar of 95.85 polarization and 1.14 ash. From the phenol ext. betaine was isolated, yielding 32.1%. F. R. Bachler

Activated carbons in sugar manufacture. Jaroslav Dědek. *Sugar* **30**, 51–2 (1928).—The employment of decolorizing carbons either in layers or in suspension is discussed. The long layer of bonechar usually employed is necessary because this

C is not of high initial decolorizing capacity. When working in suspension normally the C is used for each liquid only once so that the resulting adsorption equil. corresponds to a single use on the darker soln. The exhaustion of a C in layers may be brought about, however, by repeated use on new liquors. If, as is usual in practice, gradually darker solns. be decolorized, the final exhaustion of the C used in suspension or in layers is practically the same, *i. e.*, very nearly the theoretical max. A graph is given showing the exhaustion produced by solns. of different degrees of coloration. J. F. B.

Estimation of the value of activated carbons. JAROSLAV DĚDEK. *Sugar* 29, 255–6, 307–9(1927); *Intern. Sugar J.* 29, 446–7(1928).—Adsorption is considered from the theoretical standpoint. Invisible adsorption, that which cannot be estd. by the colorimeter, is considered often greater and more important than decolorization. The adsorption equil. must take place between the concn. of the solute on the surface of the adsorbent and the concn. left in soln. which equil. can be represented by the adsorption isotherm. In a graph given, degrees Stammer, left in soln., are plotted as abscissas, and the quantities retained by the C, in so-called Fusca degrees, as ordinates. The isotherm is found by decolorizing a soln. with increasing quantities of C and it enables one to solve questions and elucidate laws of adsorption, such as, for instance, that a C on contact with a dil. soln. cannot retain as much coloring matter as it does from a concd. one. J. F. BREWSTER

A method for determining the decolorizing power and an analysis of bone charcoal. R. PROCHÁZKA. *Listy Cukrovar.* 47, 14–5(1928).—Into a tin digestion flask are placed 100 g. of the clarifying agent and 400 g. of a soln. of known color value and sp. gr. The mixt. is immersed in a 90° water bath for 15 min. with frequent stirring; it is filtered warm with a small quantity of kieselguhr. The sp. gr. and color value are detd. as before. The method prevents caramelization and is used in regeneration studies. Routine tests for CaS and $CaSO_4$ are insignificant. Org. matter is extd. in warm NaOH; the soln. should remain clear. For P_2O_5, 5 g. bone charcoal are ignited in a Pt crucible in an elec. furnace. The residue is dissolved in a H_2SO_4 and HNO_3 mixt. NH_4 citrate soln. is added, and the mixt. is kept cool. The ppt. is washed free of Cl, dried, ignited and weighed as P_2O_5. The first ignition insures a pure ppt. FRANK MARESH

The examination of starch and its derivatives. F. L. P. KRIZKOVSKY. *Melliand Textilber.* 9, 594–6, 766–8(1928).—A compilation of methods for the phys. and chem. examn. of starches, dextrins, etc. E. R. CLARK

Studies on plant colloids. XX. Behavior of starch sols in the dark field. M. SAMEC. *Biochem. Z.* 195, 40–71(1928).—As the starch sol ages the Brownian movement of the ultramicrons ceases first, and is followed by vibration and finally complete rest. The particles aggregate and after a certain interval there are no more free ultramicrons. Two types of aggregation can be observed: spheroidal and string-like, the former occurring in sols with a blue I_2 reaction and the latter with the red reaction. The ultrafiltrate contains a very much smaller number of visible particles which are likewise much smaller than in the original sol. The differences between wheat and potato starches are only quant. Even Lintner's dextrin and starch peptized by means of ultra-violet rays can still be observed ultramicroscopically, showing the presence of typical ultramicroscopical forms. Boiling causes a reduction in the number of visible particles. Their movement is lost but the typical aggregation forms remain. Min. traces of P_2O_5 appear always to exert a stabilizing action on the starch. **XXI. The distribution of phosphorus and nitrogen within the starch grain.** *Ibid* 72–8(1928).—The sepn. of the concentric layers of the starch grain shows that the most outside portions are richest in N and P. The amylocelluloses of wheat and of corn starch grains are particularly rich in both these elements and contain besides SiO_2. The amylocellulose from potato can be prepd. N-free. The removal of SiO_2 from the starch grain does not alter the yield of amylocellulose. S. MORGULIS

The manufacture of corn starch, the utilization of the residue and the recovery of corn oil. O. K. A. KRIZKOVSKY. *Chem.-Ztg.* 52, 526–8(1928).—A description including the flow diagram. A. L. HENNE

The yield of potato starch works. B. ELEMA. Coop. Aardappelmeel Verkoopbureau, Veendam. *Chem. Weekblad* 25, 498(1928).—The best modern yield figure of potato starch is up to 11.7 kg. per hectoliter (61 kg. potatoes of sp. gr. 1.087 with 16.2% starch). The theoretical yield is 12.35 kg. B. J. C. VAN DER HOEVEN

Depolymerization of inulin (VOGEL, PICTET) 10. Carbohydrate constituents of the easily hydrolyzable hemicellulose of pine (HÄGGLUND, *et al.*) 23. The technic of

cane fertilizer experiments (WILLIAMS) 15. Rapid method of glucose determination (HORNE) 7. Dry substance and starch content of potatoes by specific weight determination (REYNAERT) 12. P_2O_5 in soils and in cane juices (COLON) 15. The Ruths accumulator in chemical works (SCHIEBL) 13. Soil analyses of Java sugar mills (ARRHENIUS) 15. The conditions of the micelles in starch (MALFITANO, CATOIRS) 2. The double fermentation process with intermediate liming (Hildesheimer process). A contribution to the question of the purification of waste liquors from the sugar factory (Nolte) 14. Boiler-feed water (McALLEP) 14. Industrial waste work of the sanitary district of Chicago (corn products) (MOHLMAN) 14. The work of Arrhenius on the Java cane soils (WILLCOX) 15. The H-ion concentration of some Porto Rican cane soils (COLON) 15. Estimation of reducing sugars (WHALEY) 7. Sugar-cane bagasse as a source of alcohol (OWEN, DENSON) 16. Dissociation constant of glutimic acid (ZAFOUK) 2. Metal-metal oxide electrodes (WATSON) 2. Thickener for separating solids in muds formed in sugar production (U. S. pat. 1,686,203) 1. Treating sewage and other waste products [from sugar factories] (Brit. pat. 284,267) 14. Recovery of N and acetone from molasses, etc. (Fr. pat. 635,915) 16. Apparatus for dissolving sugar, etc. (Fr. pat. 635,285) 1. Countercurrent filtration system for sugar (U. S. pat. 1,686,092) 13.

Drying sliced sugar beets, etc. B. J. OWEN. Brit. 285,115, Nov. 5, 1926. Various details of temps., air pressures and current velocities, etc., are specified.

Filtering sugar juices supplied as jets to a rapidly vibrating inclined screen. FRANK L. ALLEN. U. S. 1,685,621, Sept. 25. This treatment prevents obstruction of the screen by bagacillo.

Apparatus for drying sugar crystals. PAUL TUGAULT. Fr. 635,429, June 2, 1927. The sugar falls against a series of baffles and meets an ascending current of warm air. The sugar dust is extd. from the air by passing it through a centrifuge against the sides of which a fine spray of water is directed.

Grape sugar and dextrin. A. A. SCHMIDT (SHMIDT). Russ. 4545, Sept. 15, 1924. Solns. of fruit skins or pulp in concd. H_2SO_4 obtained by known methods are dialyzed before the final hydrolysis at high temps. to obtain highly concd. solns. of dextrin at a low concn. of the acid.

Recovering sucrose from mixtures containing reducing sugars. HENRY W. DAHLBERG. U. S. 1,686,440, Oct. 2. Materials such as mixed molasses and concd. "sweet water" of sugar refinery operation are regulated so that the ratio of sucrose to reducing sugar will be at least 2.8:1 and the sucrose is pptd. by treating the mixt. with $Ba(OH)_2$ or other alk. earth hydroxide to form a saccharate; the saccharate is then sepd. into an alk. earth metal compd. and sugar sirup by use of CO_2.

Sugar recovery from muds. ROBERT C. CAMPBELL (to United Filters Corp.). U. S. 1,685,118, Sept. 25. Muds sepd. from sugar juices are continuously filtered and the cloudy portion of the filtrate is continuously returned to a previous point in the process; any remaining portion of the filtrate is continuously collected and the filter cake is continuously washed and the wash water collected. An app. is described, the filter surface of which is completely cleaned at each cycle of the filter operation.

Sugar from wood, peat and moss. A. E. MOZER. Russ. 3714, Sept. 14, 1924. The materials are treated with dil. acids below 120° with a continuous agitation of the mass, and the insol. material is sepd. from the sugar soln. obtained, which is used again to decrease the amount of acid and fuel used and to obtain a higher concn. of the sugar soln.

Horizontal rotary drum mixing apparatus suitable for use in sugar manufacture. SCHNEIDER ET CIE and AKCIOVA SPOLECNOST DRIVE SKODOVY Z'AVODY V PLZNI. Brit. 284,954, Sept. 8, 1927. The drum is provided with a water jacket having baffled compartments. Various structural details are specified.

Purifying sugar solutions. KARL KOMERS and KARL CUKER. Fr. 635,624, June 8, 1927. See Brit. 283,564 (*C. A.* **22**, 4269).

Betaine hydrochloride. DONALD K. TRESSLER (to Larrowe Construction Co.). U. S. 1,685,758, Sept. 25. Concd. residual liquors of beet molasses are treated with an inorg. acid such as H_2SO_4, H_3PO_4 or HCl and with a sol. chloride such as $CaCl_2$ to obtain betaine-HCl which is sepd. from KCl and NaCl by use of MeOH.

29—LEATHER AND GLUE

ALLEN ROGERS

Unhairing with mold enzymes; preliminary investigations and industrial application. G. Abt. *Chimie et industrie* Special No., 716–21 (April, 1928).—See *C. A.* **22,** 1056. A. Papineau-Couture

Contribution to the study of tanniferous barks of Madagascar. F. Heim de Balsac and A. Deforge. Station Biol. d'Auteuil-Boulogne. *Chimie et industrie* Special No., 728–31 (April, 1928).—See *C. A.* **22,** 1055. A. Papineau-Couture

Hide powder provision. Tatarskii. *Collegium* **1928,** 463–4. Hide powder comparing favorably with English powder was prepd. as follows: Hides were limed and delimed as usual, bated with Oropon and then treated for about 4 days with NaOH. After washing, they were brought to the isoelec. point (p_H 5) with acid, washed again, dried with alc. and ground in a cooled mill. I. D. C.

Some problems of fat liquoring. Wilhelm Schindler. *Collegium* **1928,** 241–74. The factors influencing stability of emulsions are reviewed. The viscosity of some sulfonated oil emulsions was measured with Ostwald-Auerbachs viscometer (*C. A.* **21,** 3506). "Structural" viscosity was observed below 45° in alkaline (p_H 9) but not in acid (p_H 6) solns. Several sulfonated oils were fractionated according to the following scheme: 5 g. of oil was shaken first with 25 cc. of 96% EtOH, next with 15 cc. EtOH and 5 cc. *N* alcoholic KOH, then with EtOH until the EtOH was colorless. The residue (**c**) was usually a thick, bright yellow to orange-brown oil. The EtOH ext., **a** and **b,** (its vol. should be about 100 cc.) was shaken with 10 cc. H_2O, 5 cc. glacial acetic acid and 25 cc. petroleum ether, then twice with petroleum ether alone. The petroleum ether ext. was washed with 70% EtOH. The EtOH residue (**b**) was a dark brown, sirup-like product which contained the sulfonated oil. The petroleum ether ext. (**a**) was sepd. into 2 portions (a_1 and a_2) by shaking with 10 cc. *N* alcoholic KOH and 10 cc. of 70% EtOH. The petroleum ether residue (a_1) consisted of neutral fats, the alc. residue (a_2) of free fatty acids and oxy fatty acids. **b** contains the emulsifier. a_1 and **c** are neutral and so are not emulsifiers but are valuable lubricants because of their high viscosity. a_2 should be as small as possible. Pieces of chrome leather were fat liquored with soap, sulfonated oil or emulsions of these with mineral oil. The velocity of fat absorption and the quantity of fat absorbed depended on the kind of emulsifier, the drop or particle size, the temp. and the diln. of the liquor. The velocity was increased by mineral oil or fat, or by a change in p_H causing an increase in drop size. It was greatest at the beginning of the absorption. Soap solns. or soap and mineral oil emulsions were absorbed more slowly and less completely than emulsions based on sulfonated oils. More fat was absorbed from clear sulfonated oil solns. than from soap solns. I. D. Clarke

The physico-chemical nature of tannin and nontannin. P. Yakimov. *Collegium* **1928,** 426.—Temp. and degree of division of the material influence the soly. of tannin greatly but that of nontannin very little. Boiling tannin exts. caused little or no loss of tannin (except 40% loss with badan) while extn. with boiling H_2O gave results 30% to 40% lower with a corresponding increase in nontannin. The pectins produced by hydrolysis of other plant substances may combine with and ppt. tannin. Freezing increases the concn. and purity of tannin exts. Tannin and nontannin can be sepd. by dialysis because the latter is cryst. and the tannin colloidal. Dialysis at a low temp. (4°) is best because there is then almost no loss of tannin. The cell walls of the material can act as membranes. The degree of division is then a factor since grinding destroys some of the cell wall membranes. With the above principles exts. richer in tannin have been prepd. I. D. Clarke

The colorimetric determination of hydrogen-ion concentrations (p_H values) in the tannery. L. Köhler. *Collegium* **1928,** 449–53.—A colorimetric spot method for detg. the p_H of colored solns. is described. Color charts and a porcelain plate are used. The color should be observed in a thin layer of the soln.; at the edge of highly colored solns. the indicator tint is easily observed. To have as high a concn. of indicator as possible one drop of indicator is placed on the plate and then the soln. to be measured is added drop by drop until the tint no longer changes. I. D. Clarke

The Darmstadter apparatus for tannin analysis. E. Stiasny. *Collegium* **1928,** 383–8; cf. *C. A.* **22,** 2076.—A vessel somewhat similar to that of Jamet (*C. A.* **19,** 417) is described. It consists of a glass cylinder, 55 × 150 mm., with a glass filter plate sealed in one end. Metal caps fitted with soft rubber washers are screwed onto each end. It is used for shaking hide powder with the chroming or tannin ext. soln., then the soln. is removed by setting the filter end into a suction filter funnel and applying

suction. H_2O in the hide powder is adjusted by weighing the entire vessel (wt. empty about 180 g.). I. D. CLARKE

The new procedure for tannin determinations. JOH. PAESSLER. *Collegium* **1928,** 352–61.—Comparison was made of filter candles and filter papers S & S no. 590 and no. 605 for detg. sol. solids. Paper no. 605, extra hard, gave lower results (0 to 4.5%) than the candles. Paper no. 590 gave about the same or slightly lower results than the candle but with some exts. perfectly clear filtrates could not be obtained. Also filtration with paper requires much more time than with candles. Tannin exts. were prepd. by the old and the new (International) methods, then analyzed. Since the results were nearly the same the old method is preferable for it requires much less time. A vessel for washing the hide powder and detannizing the ext. is described. It consists of a cylindrical glass vessel with a conical bottom, and closed with a rubber stopper. A tube with a small Berkefeld filter at the end is inserted in the vessel to remove by suction either wash water or nontannin soln. I. D. CLARKE

Chrome tanning. VIII. Salts of chrome with formic acid and their tanning action. E. STIASNY AND G. WALTHER. *Collegium* **1928,** 389–425; cf. *C. A.* **20,** 3314.—Hexaquochromeformate, $[Cr(H_2O)_6](HCOO)_3$, I was prepd. by Werner's method. It is a gray-violet cryst. salt, slightly sol. in H_2O, which on standing changes to violet, then to green. This change is caused by hydrolysis to monohydroxopentachromeformate, $[Cr(OH)(H_2O)_5](HCOO)_2$, and formic acid; the dihydroxo salt does not form. On further aging the green soln. again becomes violet because the formate radical enters the Cr complex. In dil. soln. a complex is formed of 3 Cr to 3–3.5 formate radicals; in concd. soln. there is slowly formed the green hexaformatodihydroxychromeformate, $[Cr_3(OH)_2(HCOO)_6]HCOO.5H_2O$, II, which does not contain formato groups but formato bridges and so is more stable to alkali than the violet form. Addn. of alkali to concd. solns. of I does not lead to formation of II but to anodic violet complexes. II is not as stable, especially in dil. solns., as would be expected from its spontaneous formation from I or from hexaformatosodium chromate, III. On heating solns. of I or II the greater part of the formic acid is split off; there results nondialyzing complexes, which are not affected by HCl or NaOH and which contain many "ol" bridges. By the action of NaCOOH on $Cr(NO_3)_3$ either I, II or III forms depending on the concn. and relative proportions. If NaCOOH is in excess III, $[Cr(HCOO)_6]Na_3.4H_2O$, is formed. III is readily sol. in H_2O, anodic, and forms dark violet rhombohedrons. The 4 mols. of H_2O are given off over $CaCl_2$ or H_2SO_4. The anhyd. salt is blue-green; this color change is caused by H_2O not in the complex. Since III is a neutral salt the acid from which it is formed is strong. A 0.1 *N* soln. of III changes in 20–30 days to II. More than 6 formato groups per 3 Cr atoms do not form complexes stable to H_2O. III is stabilized by NaOH but not by HCl. A certain acidity is necessary for the change III to II. Freshly prepd. basic solns. of I or III tan well. Cr absorption is much greater than with the acetate. Hide powder took up 10% Cr from a 0.1 N, 50% basic soln. of I. II has almost no tanning action. On aging or heating the tanning action is greatly decreased because "ol" bridges form; all secondary valences of the OH groups are linked to Cr atoms and so cannot react with hide. I. D. CLARKE

Synthetic tannins. LOUIS MEUNIER AND CHARLES GASTELLU. Ecole française de tannerie. *Chimie et industrie* Special No., 699–705(April, 1928).—See *C. A.* **22,** 1054. A. P.-C.

The oil tanning of skins. P. CHAMBARD AND L. MICHALLET. *Chimie et industrie* Special No., 706–15(April, 1928).—See *C. A.* **22,** 1055. A. PAPINEAU-COUTURE

Tanning products obtained as by-products in the manufacture of wood cellulose. RENÉ ESCOURROU. *Chimie et industrie* Special No., 623–33(April, 1928); cf. *C. A.* **22,** 4002.—A review. A. PAPINEAU-COUTURE

The measuring of the colors of tanning extracts. M. A. DE LA BRUÈRE. *Cuir tech.* **17,** 342–5(1928).—The personal equation in the measuring of the color of a tanning material may be eliminated by using a photoelec. cell with galvanometer together with color filters to provide monochromatic light from some strong source of illumination. J. G. NIEDERCORN

The production of tanning extracts in Russia. P. J. PAULOWITC. *Boll. ufficiale staz. sper. ind. pelli mat. concianti* **5,** 169–70; *Chem. Zentr.* **1927,** II, 999.—In Russia, bark from pines is the most important material for obtaining tanning exts. The bark contains about 11% tannin and 7.7% non-tannins. The exts., which are very rich in sugar, have a d. of 18–22° Bé. and contain 19–25% tannin and 59–68% H_2O. Besides, willow bark with about 10% tannin is to be considered as a tannin-producing material. G. SCHWOCH

Tanning value of "Takaout" galls of Tamarix articulata. F. AND M. HEIM DE

Balsac and A. Deforge. *Cuir tech:* **17,** 347–9(1928).—A small tree, *Tamarix articulata* Wahl, native to Northern Africa, when bitten by a mite, *Eriophyes Tlaiae* Trab, forms upon its floriferous twigs galls contg. 41–56% tannin of the pyrogallol type. A tree can produce annually 20–25 kg. of galls. J. G. Niederkorn

Investigation of the galls of Pistacia Atlantica Desf. from Libya. Giuseppe A. Bravo. *Boll. ufficiale staz. sper. Ind. pellimat. concianti* **5,** 204–11; *Chem. Zentr.* **1927,** II, 1356–7.—A description of a domestic plant contg. a semi-solid oil, with a pleasant peanut-like flavor, m. 5–10°, d. 0.918. The leaves are attacked by gall wasps and produce galls in abundance. The wasps are: *Pemphigus cornicularius* Pass. (I), *P. Riccoboni* Stef. (II), and *P. utricularius* Pass. (III). Analysis of the galls showed:

	I	II	III a.	III b.
Tannins	24.04	29.21	37.76	40.32
Insol. non-tannins	20.33	25.74	15.28	12.72
Insol.	45.01	34.46	35.30	35.30
Water	10.63	10.59	11.66	11.66
Ash	4.90	4.10	3.87	3.87

J. S. Reichert

The action of dilute tannin solutions on gelatin. A. Küntzel. *Collegium* **1928,** 460–3.—In dil. tannin solns., 0.05 to 2 millimols. per l., gelatin swells and the soln. becomes turbid. Swelling and turbidity are at a max. at the same tannin concn. As the concn. increases above this max., first the soln. becomes clear and the gelatin turbid and then the turbidity is absent. It is suggested that two substances, gelatin and gelatose, having different isoelec. points, are present. The gelatose is pptd. at tannin concns. at which gelatin still swells. After the gelatin begins to swell, gelatose cannot diffuse out and ppt. and so cause turbidity. The better grades of gelatin contain less gelatose and the swelling max. is at lower tannin concns. This may prove to be a *test for the purity of gelatin.* Other acid substances, such as picric, phosphotungstic or phosphomolybdic acids, show this same phenomenon with gelatin. I. D. Clarke

Casumo, a refined divi-divi. Johannes Paessler. *Ledertech. Rundschau* **20,** 105–6(1928).—Casumo is a refined divi-divi contg. about 60% tannin. I. D. C.

Gambier. Th. Körner. *Ledertech. Rundschau* **20,** 81–4, 98–101, 123–6, 141–3, 154–7, 166–72, 180–4(1928).—A review and discussion of the history of gambier, its cultivation, methods of extn. and its uses for dyeing, chewing with betel nuts, in pharmacy, etc. I. D. Clarke

Action of acids on vegetable-tanned leather. D. Woodroffe. *J. Intern. Soc. Leather Trades Chem.* **12,** 385–9(1928); cf. *C. A.* **21,** 3484.—Strips of vegetable-tanned goat skin were immersed in 10 times their wt. of 10% solns. of HOAc, lactic acid, oxalic acid, and H_2SO_4 for 2 months, dried, and tensile strengths were detd. Leather in 10% oxalic acid was practically destroyed. Leather in 10% H_2SO_4 was very much weakened as compared to leather in acetic and lactic acids. Leathers in 5% solns. of the same acids for 3 weeks decreased in tensile strength as follows: In acetic acid, 9%; lactic, 16%; H_2SO_4, 21%; oxalic, 59%. Loss in tensile strength is in the order of increasing H-ion concn. of the solns., except for oxalic acid. Short immersion of leather in warm 10% oxalic acid or H_2SO_4 had no measurable effect on the tensile strength, measured as soon as the leather was dried. Effect of acid on aging was tested by immersing pieces of 5 different vegetable leathers in 1 *N* solns. of oxalic acid, NH_4Cl, and H_2SO_4, and in 1% H_2SO_4, for 30 min., drying, and storing for 6 months. Control pieces were soaked in H_2O. Tensile strength of each piece was measured crosswise and lengthwise of the piece. Av. decrease in tensile strength for all leathers, as compared to controls, was: in *N* NH_4Cl, 14%; in 1% H_2SO_4, 25%; in *N* oxalic acid, 29%; in *N* H_2SO_4, 66%. Individual measurements showed very large deviations from these averages. Conclusion: "The ordinary, moderate use of oxalic or sulfuric acid is not detrimental."
H. B. Merrill

Hydrolysis of leather. G. Arbuzov. *Cuir tech.* **17,** 106–12, et seq. (1928); cf. *C. A.* **22,** 4271.—Material extd. from vegetable-tanned leathers by boiling in water showed in all cases a decrease in the ratio tannin/hide substance as the time of hydrolysis increased, until a const. value was reached at the end of 4 hrs. The equil. value for the ratio tannin/hide substance for oak- and oak-quebracho-tanned sole leather was 0.8, and for quebracho-tanned sole leather 0.65: for an upper leather tanned with willow bark ext. it was 0.48, and for willow-quebracho-tanned upper leather, 0.51. Conclusion: These equilibria indicate definite chem. compds. between hide substance and tannin, and these compds. vary with the nature of the tanning material and the method

of tannage. Vegetable-tanned hide powder showed increasing values for the ratio tannin/hide substance at equil. for exts. in the following order: wattle, sulfited quebracho, valonia, chestnut, myrobalans. Hide powder swelled with H_2SO_4 prior to tanning showed higher values. Hide powder tanned with $CrCl_3$ of various basicities and concns. came to equil. very quickly. From the data obtained by analysis of the material extd. the conclusion is drawn that the stoichiometrical laws apply to compds. of $CrCl_3$ with hide substance, but that several compds. are formed contg., resp., $^3/_2$, 1, and 3 equivs. of collagen per atom of Cr; leather is considered a mixt. of these 3.

J. G. NIEDERCORN

The investigation of aqueous leather extracts prepared by Proctor's method. ERICH BÜTTGENBACH. *Collegium* 1928, 444–9.—The H electrode should not be used with aq. leather exts. because the Pt electrode is poisoned. The quinhydrone and the indicator methods give reliable and agreeing values. The purity of the quinhydrone is of greatest importance in measurements on poorly buffered solns. In making measurements with the quinhydrone electrode, the metal electrode should be entirely surrounded by quinhydrone. Leather exts. are moderately buffered systems of weak acids having dissociation constants that are not far apart. The buffer curves show that phenolphthalein is the proper indicator for titrating dil. vegetable tannin solns. The rule that chlorides increase H-ion concn. holds for vegetable tannin solns. From the direction of the buffer curves the presence or absence of dangerous quantities of strong acids in the leather exts. can be detd. with certainty. The agent used to remove the fat from the leather (petroleum ether, cyclohexone, CCl_4, CS_2) has no influence on the p_H of the H_2O ext.

I. D. C.

Observations on the methods of stuffing [leather]. H. PRIEN. *Collegium* 1928, 295–8.—A brief, general discussion of oils, methods of preventing discoloration by the oil, etc.

I. D. C.

The use of the lecithin reaction for the qualitative detection of egg yolk in leather. NIKOLAUS JAMBOR. *Collegium* 1928, 459–60.—Egg yolk in leather can be detected by the following test for phosphate: Wash the leather with 1% NH_4OH soln. to remove finishing materials; cellulose pigment finishes must be removed with amyl acetate or other collodion solvent. Then ext. 10 g. of the leather with ether in a Soxhlet app., evap. the ether and add hot H_2O and 3 cc. of 10% NaOH to the residue. Boil for a few min., cool, acidify with AcOH, boil again for a few min. and filter. Acidify with HNO_3, add $(NH_4)_6Mo_7O_{24}$ soln. and warm gently. A yellow ppt. forms if lecithin (egg yolk) is present.

I. D. C.

The permeability of hide and leather. II. The permeability gases. MAX BERGMANN AND STEPHAN LUDEWIG. *Collegium* 1928, 343–51; cf. *C. A.* 22, 1249.—Duplicate measurements of permeability did not differ by more than 1%. An increase in moisture in leather decreases its permeability but humidity control is not absolutely necessary. The loss of air through the edges of the leather may be as much as 12% but this is prevented by placing a rubber ring around the leather in the clamp. Poiseuille's law was found to hold, *i. e.*, the volume of gas passing through the leather per minute, divided by the pressure is const. (K). There was no difference whether the gas was passed through from the flesh side to the grain or *vice versa*. Flesh splits were much more permeable than grain splits. The permeability of several leather pieces placed together can be calculated from that of each piece by the formula $(1/K) = (1/K_1) + (1/K_2) + (1/K_3)$........, where K_1, K_2, K_3 etc., are the consts. for each piece.

I. D. CLARKE

The permeability to water of sole leather. H. VAN DER WAERDEN. *Collegium* 1928, 453–8; cf. following abstract.—The app. described previously was used to det. the time required for H_2O to penetrate typical sole leathers. The time varied from 0.2 min. to about 7 hrs. W. concludes that a normal value for good leather cannot be assigned and that this test is of little value in detg. the quality of sole leather. Surface dressings or finishes can give the leather a greater resistance to H_2O temporarily but not permanently. The dressing should be removed from the grain and flesh sides before making measurements. The permeability is increased considerably by wetting.

I. D. CLARKE

The electrical determination of the permeability to water of sole leather. J. N. GEERSEN. *Collegium* 1928, 337–43.—The development is described of an elaborate app. for detg. the time required for H_2O to penetrate leather. The leather is held in a special clamp under a const. head of water. There is a p. d. of 40 v. across the leather. When H_2O penetrates the leather and closes the circuit a relay closes a second circuit which rings an alarm clock; then both circuits are automatically broken and the clock is stopped.

I. D. CLARKE

The action of sodium sulfide in the manufacture of sole leather. CASABURI. *Cuir tech.* **17**, 316–21, et seq.(1928); cf. *C. A.* **21**, 4089.—Theories of the action of sulfides in depilation are briefly reviewed. Solns. of 2 varieties of com. Na_2S of the same sp. gr. did not contain identical amts. of NaOH and NaSH, and in a series of tests differed slightly in their action upon portions of a Bahia hide. Tests were made upon sections of Bahia hide with solns. of Na_2S, Na_2S + NaCl, Na_2S + NH_4Cl, and Na_2S + $CaCl_2$. It is maintained that soaking may safely be omitted, and the skin brought directly into Na_2S solns. The quantity of hydroxyl alkali taken up by the skin is always the same in solns. of com. Na_2S, although the concn. may vary somewhat; the SH^- taken up varies with its concn. in the soln., about half of it being taken up. The addn. of NH_4Cl or $CaCl_2$ to the sulfide soln. is not strongly recommended, although it is preferable to the use of lime alone. Best results are obtained when NaCl is added to the Na_2S soln., giving a max. swelling and yield of leather when used in moderate concns. (Na_2S — $1^1/_2$° Bé., NaCl, 5.4 g. per l.). The yield of leather prepd. with Na_2S was greater than that from skin treated with lime only. J. G. NIEDERCORN

The manufacture of glove leather. M. E. AMSTERDAMSKY. *Cuir tech.* **17**, 278–81(1928).—A description. J. G. NIEDERCORN

An aid in dyeing: the mordant RS. V. CASABURI. *Cuir tech.* **17**, 297–304(1928).—See *C. A.* **22**, 3783. J. G. NIEDERCORN

Correctly dyed upholstery leather. FRANZ FAMMLER. *Ledertech. Rundschau* **20**, 110–1(1928).—To prevent dye from rubbing off of finished leather the leather should be warmed before dyeing and the dye soln. should be dil. I. D. C.

The dyeing of velvet or suede leathers. J. W. LAMB. *Dyer, Calico Printer* **60**, 94–5, 141(1928).—A method based on the use of ammonium acetate combined with the color is recommended for assisting penetration of the dyestuff. Some typical recipes for obtaining different colors and black are given. RUBY K. WORNER

Industrial waste work of the sanitary district of Chicago [tannery waste] (MOHLMAN) **14**. Analysis of fats (GILLET, *et al.*) **27**. The fluorescence of wood pulps and vegetable tanning extracts (GERNGROSS, *et al.*) **23**. Textile fibers from skins of sharks, etc. (tanning) (Brit. pat 284,297) **25**. Wetting out and dyeing or other treatments of leather (U. S. pat. 1,686,836) **25**. Leather substitute (Russ. pat 4159) **30**. Extracts from glands of sharks, etc. [for treating skins before tanning] (Brit. pat. 284,668) **17**.

Unhairing and preparing skins. CHARLES J. M. M. LE PETIT. Fr. 32,554, June 12, 1925. Addn. to 609,316. Enzymes produced by the cultivation in a suitable medium of *Aspergillus oryzae* are used for unhairing skins. Cf. *C. A.* **21**, 1371.

Depilatory. R. BOTSON. Brit. 285,152, Nov. 11, 1926. See Can. 275,518 (*C. A.* **22**, 1249).

Depilating and softening hides. SOC. PROGIL. Brit. 284,719, Feb. 4, 1927. Enzymic liquids which may be prepd. by the use of bacteria such as *B. subtilis*, *B. mesentericus* or *B. liquefaciens* (developed in peptonized gelatin or meat ext. and centrifuged) are used in depilating and softening skins prior to tanning. In treating goat skins, NH_4Cl also is used, and with sheep skins Na_2CO_3, in treatments effected at a temp. of about 37°.

Tanning leather. A. A. FEDOTOV. Russ. 4556, Sept. 15, 1924. $(NH_4)_2SO_4$ and a mixt. of alkali and alk. earth salts with sulfonated aliphatic or aromatic compds. are used for softening sole leather which also act as reducing agents when the leather is later treated with a chromate soln. after it was treated with N or without this treatment.

Tanning leather. JOHANN G. KÄSTNER. Fr. 635,227, May 30, 1927. A decoction of stones from different kinds of carobs is added to the tanning substances.

Tanning and auxiliary treatment of fish skins. A. EHRENREICH. Brit. 284,197, Jan. 24, 1927. Before or after tanning, dermal armor is removed from the skin of sharks or the like by use of H_3PO_4 or HF, with or without addn. to the bath of salts such as NaCl, alkali metal or other salts of H_3PO_4 or HF or salts such as those Cu, Ni, Pb or Al which act as catalytic accelerators as does also an elec. current of low voltage. Jets of compressed air may be used for circulating the liquid. Cf. *C. A.* **22**, 2855, 3801.

Emulsifying agent from fish roe. A. EHRENREICH. Brit. 284,707, Feb. 4, 1927. Roe of sharks or similar fish roe is reduced to a paste and mixed with a preservative or dried *in vacuo* at 40–50° to obtain a product suitable for use as an emulsifying agent in the *manuf. of greases for use in the leather industry*, etc.

Leather substitute. N. I. TIKHOMIROV. Russ. 3586, Sept. 15, 1924. Xanthate of the epidermis is formed from vegetable fibers on the surface of the tissue by treat-

ment with a soln. of KOH under pressure and later with CS_2 vapor; the xanthate is then decomposed as usual.

Glue. STOCKHOLMS BENMJOLSFABRIKS AKTIEBOLAG. Brit. 284,704, Feb. 4, 1927. A glue soln. is allowed to fall in drops which strike separately on a moving surface such as a belt or revolving cylinder (which may be treated with powd. materials such as talc, chalk, H_3BO_3, pulverized glue or starch) and are cooled to form stiffened drops or granules.

Glue. A. EHRENREICH. Brit. 284,593, Jan. 31, 1927. Skins, pectoral and other fins, cuttings or waste from fish such as plagiostomi are washed to remove solid impurities, "dissolved" at a temp. of not over 80° to produce a viscous fluid, which is skimmed to remove further impurities, evapd. *in vacuo* until it contains about 70% of water, agitated to produce a frothy mass and further dried *in vacuo* to produce flake glue. Powder glue may also be made by carrying the agitation further before drying or by crushing the flake product. Compressed air may be used for the agitation and an app. is described. Cf. *C. A.* 22, 883.

30—RUBBER AND ALLIED SUBSTANCES

C. C. DAVIS

Priestley, the English godfather of rubber. A. DUBOSC. *Rev. gén. caoutchouc* 5, No. 44, 7–8(1928).—Historical sketch. C. C. DAVIS

"Mineral rubber." An historical point. A. D. LUTTRINGER. *Caoutchouc & gutta-percha* 25, 14157(1928).—Old references to "mineral rubber" are cited to show that the term has been in use for many years. C. C. DAVIS

Mechanical tests of rubber and probabilities. R. FRIC. *Chimie et industrie* Special No., 541–6(April, 1928).—A mathematical discussion based on the results obtained in tensile tests of 732 test samples as nearly the same as they could be made. A. PAPINEAU-COUTURE

Methods for controlling changes in rubbers. J. VILLEY AND P. VERNOTTE. *Chimie et industrie* Special No., 534–6(April, 1928); cf. *C. A.* 19, 1208.—A discussion of the conditions which should be fulfilled by methods for following and estg. quantitatively the changes in rubber on aging. Two of the important requirements insisted upon are that the test sample should not be destroyed so that the change in the rubber may be followed right through on the same sample, and that the results should be capable of numerical expression. Two methods are suggested as suitable, a torsion test, and a dielec. test (*C. A.* 18, 2617). A. PAPINEAU-COUTURE

The development of rubber reclaiming since the War and its importance in the economics of rubber. PAUL ALEXANDER. *Gummi-Ztg.* 42, 2796–8(1928).—Historical. C. C. DAVIS

Present researches in the rubber industry. ANDRÉ BLOC. *Science & industrie* 12, No. 170, 37–41; No. 174, 47–9.—An illustrated review and description, dealing with new methods and improvements in the *prepn. of raw rubber*, the *electrolysis of rubber*, the *use of concd. latex, synthetic rubbers, org. accelerators, antioxidants* and the *manuf. of reclaimed rubber*. C. C. DAVIS

Investigations on the structure of rubber. PAUL BARY AND ERNST A. HAUSER. *Rubber Age* (N. Y.) 23, 685–8(1928).—English version of the article in *C. A.* 22, 4005. C. C. DAVIS

The effect of heat on raw rubber in the presence and absence of air. J. D. FRY AND B. D. PORRITT. *Trans. Inst. Rubber Industry* 3, 203–16(1927).—Mech. working, heat and atm. O are all responsible for the phys. changes accompanying milling. Of these mech. work and heat are already considered to be responsible for the plasticizing effect, and the influence of O has not been realized. The present paper shows the important *part played by O* and the different effects produced in its presence and absence. The effect on the soln. viscosity was first detd. by heating rubber in air at different temps. from 100° to 150°, under which conditions it was found that the higher the temp. the lower was the subsequent soln. viscosity. Rubber milled to different extents was then heated in air at different temps. from 106° to 180° for different periods (30 min. to 4 hrs.), after which the soln. viscosities of the products were detd. By comparing the *effect on the soln. viscosity of the time of milling and the time of heating*, it was found that around 100° heating had relatively little effect, but above this temp. the effect of heat became greater and at 150° the curve of viscosity against time of heating closely approximated the curve of viscosity against time of milling. The chief effect produced by milling can therefore be duplicated by heating rubber at 150° for a few hrs. The

curves were of an exponential character and suggested a *chem. reaction*, for which reason the expts. were repeated under identical conditions with different proportions of air and *in vacuo*, H, N and steam. *In vacuo*, H, N or steam there was little change in viscosity even after heating 4 hrs. at 150°, whereas in air the viscosity diminished with increase in the proportion of air. Thus with 1 g. of rubber in 9 cc. of C_6H_6, the viscosity was 469 with no O, decreased to 393 with 0.000046 g. of O, to 317 with 0.000103 g., to 160 with 0.000491 g., to 99 with 0.000989 g. and to 57.6 with an unlimited air supply. The results show that both O and heat are necessary to obtain the ordinary effect produced by milling, and that if the only change desired is reduction of the soln. viscosity, the results accomplished by milling may be reproduced by heating in the presence of O. The mechanism of this action of O and heat remains undetd. A general discussion follows the paper. C. C. Davis

The hardness testing of vulcanized rubber. T. R. Dawson. *Trans. Inst. Rubber Industry* **3**, 217–33(1927).—A crit. survey of various methods of measuring the hardness of rubber, with a description of the principles and technic of the *durometer, plastometer* and *scleroscope* types of app., with references to the literature on the subject. In tests of different rubber mixts. at different temps. (60–80°F.) with a Shore scleroscope, the rebound increased in direct proportion to the increase in temp., and decreased with increase in the time of cures. The magnitude of this increase with temp. varied greatly with the compn. of the mixt. The variation with time of cure was of minor importance; the scleroscope measures primarily the resilience and is useless for detg. the state of cure. In general with increasing proportion of filler or pigment, the resilience decreased progressively, in direct contrast to metals where the harder the metal the greater the scleroscope rebound. *Application* for the first time *of the Herbert pendulum to rubber* showed that the time of swing decreased with increase in the proportion of fillers or pigments, *i. e.*, with increase in hardness, again in contrast to the behavior of metals. A graphical *comparison of plastometer and scleroscope tests* showed an essentially linear relation between the 2 series of values, while the proportional changes depended upon the filler or pigment. In conjunction with previous work, the expts. indicate that the fundamental factors governing dynamic indentation tests also play the chief role in static identation tests. C. C. Davis

Investigation of the structure of stretched rubber. Lothar Hock and Walther Barth. *Z. physik. Chem.* **134**, 271–8(1928).—X-ray photographs of stretched synthetic Me rubber at −60° show interference bands with sharp edges and weak center indicative of a tendency toward line formation in nearly the same positions as the lines of stretched natural rubber. G. L. Clark

Present knowledge of the constitution of the rubber molecule. S. C. J. Olivier. *Chimie et industrie* Special No., 537–40(April, 1928).—A brief critical review of the various theories proposed as to the chem. constitution of the rubber mol. A. P.-C.

The orderly micellar structure of rubber. H. Mark and G. v. Susich. I. G. Farbenindustrie A. G. *Kolloid-Z.* **46**, 11–21(1928).—When pieces or films of natural rubber are stretched greatly an orientation within the member takes place not only in the direction of stretch but in the directions at right angles to it. X-ray analysis of such a crystd. prepn. assigns the stretched rubber to the rhombic crystal system. The identity period of the elementary units is a = 12.3, b = 8.3, c = 8.1 A. U. The no. of isoprene residues in the elementary unit is 8. The crystal class is probably V or V_h. Possible crystal structures are discussed and a space distribution of the C atoms is proposed which brings into agreement the orientation of the primary valence chains in the direction of stretch, the somewhat altered atom spacing for the C=C and C=C linkages, and the observed intensities of the most important interference bands. Several chem. reactions are described, by means of which it was sought to convert stretched rubber into derivs. retaining the structure, much as is the case in a number of topochem. reactions of cellulose. The rubber derivs. gave the x-ray pattern for amorphous material. F. L. Browne

The two coagulations of latices. René Audubert and G. Lejeune. *Rev. gén. colloïdes* **5**, 713–22(1927).—Only fresh *Hevea* latex was used by de Vries when he proved that under certain conditions it can be coagulated twice in succession with an intermediate dispersed state. This suggested similar expts. with *Hevea* and *Landolphia* latices preserved with NH_3, and with p_H values much greater than those of de V. Excess NH_3 was first removed by evapn. *in vacuo*, giving a product with p_H of 9–10. In all cases the concns. of the acid solns. added were so adjusted that regardless of the quantity of acid, the vol. added made the new vol. twice the original vol. Redispersion and recoagulation are most distinct with *Landolphia* and AcOH. When the latex has a high rubber content, *viz.*, above 25%, coagulation is normal and increas-

ing proportions of acid merely accelerate the single and final coagulation. When the latex contains 15–25% rubber, addn. of acid (1) first causes complete coagulation (clear serum), (2) then redispersion into the form of agglutinated globules, which pass through a max. condition, and (3) finally complete coagulation a second time. In latex contg. less than 15% rubber, the redispersion is still more pronounced and complete so that the mixt. becomes completely liquid again; nevertheless a second coagulation takes place with still more acid. Throughout the redispersion, the elec. charge on the granules remains negative, so that the redispersion cannot be explained by an electro-capillary inversion of the globules, the concn. of acid at the time corresponding to the isoelec. point of rubber. When casein or gelatin is first added to the latex, coagulation is still abnormal, though different insofar as the same charges occur at lower p_H values. With casein or gelatin, the first agglutinated aggregates have a negative charge, whereas the flocculates of the second coagulation have a positive charge. The p_H corresponding to this inversion of charge is not near the isoelec. point of the protein (4.7) but is more strongly acid, *viz.*, 2–3. This suggests that the casein or gelatin envelops the rubber globule so that the inversion of the charge of the micelles comprising this protective film governs the inversion of the charge of the globule + film. The difference between the p_H of inversion and that of the isoelec. point of the casein or gelatin indicates that the charge of the rubber plays a part, but that the natural protein does not. The natural protein is sep. from the rubber globule (peptized) both in the original latex and during the period of redispersion, and can be removed by dialysis. Assuming that the isoelec. point of the natural protein is in the alk. region, a negatively charged latex globule adsorbs the protein micelles, the resultant, rubber-protein remaining negative. A small increase in H ions diminishes this charge, with adsorption of H ions. With further addn. of H ions the negative charge is so much reduced that agglutination and coagulation follow. With the addn. of still more H ions, the negative charge is so greatly diminished that the protein micelles are liberated and peptized and the coagulated rubber reverts to a state of agglutination. Finally with more H ions, the protein is coagulated and its network structure entraps the agglutinated globules, causing the second coagulation. C. C. DAVIS

Dispersoidological investigations of latex. P. P. VON WEIMARN. *Bull. Chem. Soc. Japan* **3**, 157–68(1928).—Latex preserved with NH_3, concd. latex (80% rubber) and vulcanized latex were used in the expts. In NH_3-preserved latex, particles of every shape described by previous investigators were found, the no. of ultramicroscopic particles being considerably greater than the no. of microscopic ones. A comparison of photomicrographs of *Hevea* latex and the latex of *Ficus elastica* and of gelatinous spherulites of cellulose (cf. *C. A.* **22**, 873, 4028) indicated that in some latexes emulsion-suspensions of gelatinous isospherulites are present, probably in the aggregate-fluid-cryst. state. The film surrounding the viscous internal fluid of latex particles is, contrary to Freundlich and Hauser, probably composed of a mixt. of rubber and protein particles. In conjunction with the works of previous investigators, it is concluded that latex is a polydisperse system of isoaggregate particles (isospherulites), the general consistency of which is fluid and gelatinous. The individual solid particles composing the isoaggregate particles are for the greater part invisible under the ultramicroscope. The components of the serum (the dispersion medium in which the isoaggregate particles are suspended), *viz.*, proteins, water, resins, etc., are present not only in the surface film but also inside the isoaggregates. The non-rubber components play corresponding roles in the changes in consistency and structure which the isoaggregates undergo during drying and other coagulation processes. The high elasticity of rubber depends upon the presence in the viscous liquid or gelatinous medium of solid structural elements which possess the ability to become spirally curled after release from tension. The *gelatinization of latex by extremely concd. aq. solns. of dispergators of proteins, e. g.*, LiI, LiSCN, $Ca(SCN)_2$, NaI, $Ca(NO_3)_2$, $CaCl_2$, polyphenols, pyrogallol, resorcinol, thiourea, guanidine thiocyanate, AcOH and KOH solns. and by *aggregators of proteins, e. g.*, Na citrate, KNa tartrate and K_2SO_4, was also studied. At suitable temps. and concns., dispergators cause almost immediate and complete gelatinization, with formation of a coherent jelly. This can for instance be brought about by agitating at room temp. an equal vol. of satd. aq. LiI or LiSCN with latex. The structure of these jellies is such that they have greater strength longitudinally than transversely, and the higher the temp. of formation the stronger they are. These coherent jellies show syneresis. Aggregators of proteins do not coagulate rubber in latex, at room temp., even after long standing, but by pouring latex into boiling concd. solns. and continuing the boiling, flaky coagula are obtained. By coagulation of latex through addn. of concd. solns. of silk, casein, chitin or keratin in aq. solns. of dispergators,

coagula of mixed compn. are obtained, *viz.*, *rubber-silk*, *rubber-casein*, *rubber-cellulose*, *rubber-chitin* and *rubber-keratin*. The properties of these mixts. are under investigation. When vulcanized latex is gelatinized by the addn. of aq. solns. of dispergators, the jellies are weaker than those formed from raw latex, but by compression the tensile strength is increased. C. C. DAVIS

Purification and fractionation of rubber. VII. RUDOLF PUMMERER, ALBRECHT ANDRIESSEN AND WOLFGANG GÜNDEL. Univ. Erlangen. *Ber.* **60B**, 1583–91(1928); cf. *C. A.* **22**, 886.—*I. Alkali purification of latex concentrate.*—As shown in the earlier papers fresh latex and that preserved with NH_3 behave differently towards alkali. Expts. with the latex concentrate "Revertex" have further shown that the latex preserved with NH_3 has been altered in still another way. The statement of P. and Pahl that their "total rubber," obtained from NH_3-preserved latex with alkali, is protein- and N-free, needs correction. Even after most thorough and prolonged treatment with alkali at 50°, it still contains 0.15–0.4% N. On combustion with a reduced Cu spiral the C and H values add up to about 0.4% less than 100%, and as a substance with 0.4% of protein N should show a deficit of about 1% (because of the O present), the N remaining in this NH_3-preserved latex after purification with alkali must be amine N, evidently produced by the action of the NH_3 on the latex during the more or less protracted period of preservation. A gel rubber with 0.4% N refluxed 1 day in C_6H_6 with dil. NaOH yielded no amino acids (ninhydrin reaction) to the aq. alkali, nor did the rubber itself give the ninhydrin test when boiled with the reagent. On the other hand, ordinary "Revertex" yields a "total rubber" with only 0.04–0.1% N which is increased to 0.17% in the "gel rubber" remaining after the "total rubber" is extd. with Et_2O. A prepn. similar in properties to the repptd. gel rubber and still contg. 0.15% N can also be obtained by allowing the gel skeleton from crepe to swell in C_6H_6 and pptg. the clear C_6H_6 soln. after some weeks. "Sol rubbers" from crepe also often have a similar N content. *II. Fractional ether extn. of different latex and raw rubber prepns.*—Various rubber prepns. were extd. continuously in an app. which is described. (1) The extn. curve (with Me_2CO) for a purified "total rubber," prepd. from preserved latex with NaOH according to P. and Pahl, showed a distinct inflection after about 40 hrs. when 65–70% of the total rubber had dissolved, and after that there is very little further soln. (finally only 0.2–0.3% in 24 hrs.); the residue and these last slowly-dissolving traces are apparently gel rubber, and as the soly. of the residue from the 10th to the 30th day remains practically const., the gel rubber, insofar as it dissolves, must be quite homogeneous. (2) The extn. curve for NH_3-preserved latex, such as used for the alkali purification for (1) but merely freed of H_2O-sol. substances by dialysis, then coagulated and extd. with Me_2CO, rises much more slowly than that for (1) and in 850 hrs. the quantity extd. is still far less than in (1) after 50 hrs. There is an inflection, but not so marked, in this curve also. (3) The curve for Para crepe is remarkably similar to the preceding curves. After 52% has been extd., very little more goes in soln. Such an Me_2CO-extd. crepe, freed of Me_2CO in a high vacuum, is not immediately suitable for fractional extn. with Et_2O as it swells up and breaks up into minute flocks which are carried over by the solvent, but after it has stood 3 months under CO_2 Et_2O exts. from it the sol rubber more rapidly and in larger quantity than originally (55% in 45 hrs., the stationary stage being reached in 150 hrs.); after 700 hrs. only 16.8% residue (gel skeleton) remains. The same Me_2CO-extd. crepe, allowed to stand 1.5 yrs., gave a greater quantity (28.1%) of gel skeleton. The sol rubber thus obtained contained 88.18% C and 11.94% H, the gel skeleton 81.35% C, 11.06% H, 2.06% and N, 1.02% ash. The latter was allowed to stand 6 weeks under C_6H_6, and the clear C_6H_6 liquid then evapd. *in vacuo*, yielding a gel rubber with 88.23% C, 11.88% H and 0.15% N. To det. whether or not the increase in sol rubber after extn. with Me_2CO was due to the heating rather than the action of the Me_2CO, 1 sample of *raw* crepe was heated 6 days at 60° under CO_2, and another allowed to stand 6 days in Me_2CO, and the 2 samples, together with a 3rd of untreated crepe, were allowed to stand 6 days under Et_2O with occasional shaking. The 1st yielded 82.3, the 2nd 56.7, the 3rd only 40% sol rubber. The increased sol rubber yield is therefore chiefly a thermal effect. After standing a yr. under CO_2 the gel skeleton yielded to Et_2O 4.6% more rubber than calcd. from its extn. curve at the time of its prepn.; after heating 30 days at 60–5° it contained 27.5% sol rubber. (4) With the continuous extn. method the sol rubber in smoked sheet dissolves rapidly in Et_2O; the curve shows a quite marked inflection at 70% extn. after 60–70 hrs.; final value after 700 hrs., 86%; the gel skeleton contains 77.89% C, 10.90% H, 3.26% N, 1.91% ash. *III. Relations between sol and gel rubber.*—These depend on the previous history of the prepn. and can well be explained on the basis of an equil. attainable from both sides, but, as already

pointed out (*C. A.* **22,** 4005) not all sol fractions are involved uniformly in the assumed "equil." **VIII. Preparation and molecular size of isorubber nitrone.** RUDOLF PUMMERER AND WOLFGANG GÜNDEL. *Ibid* 1591–6.—P. and G. have been studying Bruni and Geiger's isorubber nitrone (I) (*C. A.* **21,** 4092) to see whether it might be used to distinguish between sol and gel rubber and to det. the mol. wt. of the rubber mol. Only PhNO was used. As a whole B. and G.'s observations were confirmed, but with PhNO it is very difficult to prevent a slight absorption of O, especially when, according to B. and G.'s general method, the components are warmed 15 min. in C_6H_6 on the H_2O bath. I, both in soln. and in solid form, is far more sensitive than rubber to O. It is best to work in the cold and in as concd. a soln. as possible in C_6H_6 under CO_2 or N_2. The originally very viscous soln. becomes mobile in 20–30 min., while the whole reaction requires 1–2 days, depending on the temp., for its completion. In C_6H_6 and $PhNO_2$ the I produces depressions of the f. p. corresponding to a mol. wt. of 1200–1400 (calcd. for a substance formed from a rubber mol. with 8 isoprene groups condensed with 8 mols. PhNO with loss of 16 H atoms, 1384). As in the menthol detns. on rubber, the measurement must be taken only when constancy is reached (1–2 hrs.); after this, the value does not change in 14 hrs. The conclusions previously reached (from the menthol detns.) as to the size of the rubber mol. are thus confirmed. C. A. R.

Plasticity determinations in crude rubber. VI. Changes in plasticity on keeping the rubber. O. DE VRIES. Proefstation voor Rubber, Nederlandsch-Indie. *Arch. Rubbercultuur* **12,** 411–9(1928) (Summarized in English 420–2); cf. *C. A.* **22,** 3316.—Various samples of smoked sheet and of pale crepe which had been kept for long periods were tested to det. changes in their plasticity, viscosity and vulcanizing properties. The results showed considerable variations, some rubbers changing much faster than others. Rubber 12 yrs. old was still in fairly good condition. C. C. DAVIS

A new plasticizing agent for rubber. PATSCHKE. *Caoutchouc & gutta-percha* **25,** 14156–7(1928).—*Caoutchol* is a brown-black oil, with an odor resembling pine tar, and practically non-volatile below 200°. It is a true softener according to the terminology of Burbridge (cf. *C. A* **21,** 1030). It has antioxidant properties, is a mild accelerator, and is useful in reclaiming. C. C. DAVIS

Stress-strain curves for plastic sulfur and raw rubber at various temperatures. JOHN D. STRONG. *J. Phys. Chem.* **32,** 1225–30(1928).—Detns. of the stress-strain curves of raw rubber and of plastic S at various temps., in which the data were recorded automatically and were practically independent of plastic flow, showed that there is a marked similarity between the curves of these 2 substances, the same characteristic influection point being evident in each case. The *prepn. of plastic S* was carried out by pouring the S into aq. NaCl below 0°, under which conditions it was of a clear yellow color and retained its elastic properties for many hrs. With a means of stabilizing this elasticity, plastic S should be a satisfactory and cheap *substitute for rubber.* C. C. DAVIS

Sulfur and selenium. WEBSTER NORRIS. *India Rubber World* **78,** No. 4, 60–2 (1928).—A description, from the historical point of view, showing the results obtainable with the use of Se in conjunction with S. C. C. DAVIS

Elastic behavior of india rubber. G. B. DEODHAR AND D. S. KOTHARI. *Indian J. Physics* **2,** 305–18(1928); cf. *C. A.* **17,** 1917.—A dynamical method is described for detg. the variation of the modulus of rigidity of rubber with stress. Tests of 3 samples showed that the rigidity increases linearly with stress up to the breaking point A qual. study of the effects of heat shows that a stretched band, when heated to about 100°, contracts, but if the heating is stopped the band extends until its length exceeds that before heating, and this extension is permanent. It is possible that, just after heating, the rigidity falls considerably, but after some time it regains almost its initial value at that load. The logarithmic decrement, unlike that of a metal, decreases with the load. The behavior of metals is similar, the difference being one of magnitude only. In variation of "torsional stiffness" with load, the behavior of rubber seems to resemble that of annealed wire. B. C. A.

New developments with dispersed rubber. H. A. WINKELMANN. Philadelphia Rubber Works Co. *India Rubber World* **78,** 53–5(1928).—A description of the more recent developments (cf. Tuttle, *C. A.* **17,** 2204; **18,** 1065; **19,** 1207, 1792; Pratt, *C. A.* **18,** 2086; **19,** 420; **20,** 678; **21,** 291, 1568, 3767). Aq. dispersions are finding an increasing no. of uses outside of the rubber industry, notable among which are in the textile and paper industries. Thus in the *textile industry,* aq. dispersions can be used in the manuf. of automobile topping, rugs, mats, upholstery, raincoats, bags and webbing. In the *paper industry,* pulp may be impregnated with dispersed rubber, besides which it is used in the manuf. of bags and wall board. Other newly developed

uses, some in an exptl. stage, are described. The technic of the prepn. of aq. dispersions has been improved, including the use of a variety of *dispersing agents* to suit best the particular problem, such as fatty acids, soaps, glues, saponins, sea moss, albumins and clays. The types of rubber, or rubber mixts. which it is possible to disperse are practically unlimited, and uniform consistency, concn. and quality are readily secured.
C. C. Davis

Dispersion of pigments in rubber. I. Microscopical studies of agglomeration and flocculation. Ernest A. Grenquist. Fisk Rubber Co. *Ind. Eng. Chem.* **20**, 1073–8(1928).—The tendency during milling of particles to pack and form secondary units is defined as "*agglomeration*," and dense formations of completely dispersed particles originating during vulcanization as "*flocculation*." "*Aggregation*" refers to cases where agglomeration and flocculation cannot be distinguished. A review of the literature (63 references to which are given) deals with the various factors which govern the dispersion of pigments in rubber, especially agglomeration and flocculation. Expts. are then described in which various pigments, including S, C black, ZnO, stearic acid, di-*o*-tolylguanidine in various combinations, were mixed in rubber and their state of dispersion, agglomeration and flocculation were detd. microscopically. In many cases the behavior was similar to dispersed particles in other systems. Agglomeration occurs around larger foreign nuclei. During vulcanization or even during heating of a rubber-C black mixt., flocculation of previously dispersed particles occurs, the causes and effects of which seem to vary with the components and the conditions.
C. C. Davis

Organic rubber colors. W. J. S. Naunton. *Trans. Inst. Rubber Industry* **4**, 68–84(1928).—A crit. review and discussion of present developments in the use of org. colors in rubber, with certain new data. Tests of the aging effects of some typical org. colors compared with red Fe oxide and ultramarine showed that, in general, org. colors do not have a deleterious effect on natural aging, but may hasten deterioration when the rubber mixts. are heated in air at 70°, unless protected by an antioxidant. The problems encountered in the use of org. colors in latex to be vulcanized or electrolyzed and in dry rubber mixts. are then discussed. Colors can conveniently be divided into those (1) sol. in rubber; (2) slightly sol. in rubber, and (3) insol. in rubber, the latter class including org. pigments and lakes. Sol. colors must not be used in proportions above the soly. limit; otherwise they crystallize out (bloom). At ordinary temp. this limit is about 0.3% in pale crepe. Some substances (*e. g.*, Fe oxide) promote this crystn. and blooming; others inhibit it. Incorporation of colors in rubber may be facilitated and made more nearly uniform by converting the colors to their stearates by preliminary fusion with stearic acid. Colors slightly sol. in rubber have certain advantages which make them the most satisfactory class. In making transparent rubber, Zn and Cd stearates are the best activators, Cd stearate being preferable in most cases. Various troubles are also encountered in the manuf. of various colored ebonites, which may be minimized by the proper combination of S, accelerator, choice of color and conditions of curing. A general discussion follows the paper. Also in *Rubber Age (London)* **9**, 254–61(1928). C. C. Davis

Carbon blacks and their use in rubber. III. Aging effects. L. B. Cox and C. R. Park. Delano Land Co., Los Angeles. *Ind. Eng. Chem.* **20**, 1088–91(1928).—In continuation of the earlier expts. (cf. Goodwin and Park, *C. A.* **22**, 3802) the influence of the various blacks on the aging of rubber mixts. contg. the blacks was studied. Changes in the tensile strength and resistance to abrasion and increases in wt. were used as criteria of the aging. The aging varied with the different blacks, the best aging being obtained with Thermatomic, followed by Goodwin, Charlton, Micronex and Super Spectra in the order named. With respect to the influence of accelerators on the aging, the beneficial influence increased in the order: diphenylguanidine, hexamethylenetetramine, ethylideneaniline, mercaptobenzothiazole. Stearic acid showed no influence on the aging properties of the vulcanizates. C. C. Davis

Critical discussion of results of tests of carbon black mixings with reference to hysteresis losses and the relation of these tests to the resistance to deterioration. Lothar Hock. *Kautschuk* **1928**, 89–90.—Tests, based on an earlier publication by H. (cf. *Kautschuk* Sept. 1925), are described, in which the influence of "Durex" C blacks in an accelerated rubber mixt. was detd. C. C. Davis

Critical discussion of tests of carbon black mixings. Werner Esch. *Kautschuk* **1928**, 115–6.—Comments on a paper by Hock (cf. preceding abstr.) C. C. Davis

Recording roll heat of calenders. C. E. Maynard. Fisk Rubber Co. *India Rubber World* **78**, 62(1928).—A new *automatic app.* is described and illustrated.
C. C. Davis

Reënforcement of rubber by fillers. JOHN T. BLAKE. Simplex Wire & Cable Co., Cambridge, Mass. *Ind. Eng. Chem.* **20**, 1084-8(1928).—A new *theory of the reënforcement of rubber by pigments* is advanced, in connection with which a reënforcing filler is considered to be one which forms a bond with the rubber which is stronger than the matrix itself. The ΔA function of Wiegand (cf. *C. A.* **19**, 3386) is a practical means of expressing the reënforcing effect of a filler, but the range of vol. over which the bonding of the filler is greater than the strength of the rubber matrix gives a better understanding of the condition of the filler in the rubber. A "*mol. tensile*" *curve* serves to illustrate and substantiate this point of view. The *mechanism of the dispersion of fillers or pigments* is then studied theoretically, the work of Langmuir and Harkins being adapted to show that the fatty acids and esters are responsible for the wetting and dispersion of the particles. Calcns. of the quantity of these dispersing agents and of the heats of wetting conform to the exptl. values. In this way the *role of fatty acids and other polar compds.* is put on a sound theoretical basis. Rubber mixts. may be improved by delaying the break in the mol. tensile curve by increasing the range over which dispersion is complete. C. C. DAVIS

Balata gum. A. D. LUTTRINGER. *Caoutchouc & gutta-percha* **25**, 14,111-5, 14,154-6(1928); cf. *C. A.* **22**, 4005.—A general treatise on the characteristics and uses. C. C. DAVIS

The aging of rubber. Its preservation. F. JACOBS. *Caoutchouc & gutta-percha* **25**, 14,110-1(1928); cf. *C. A.* **22**, 1057, 4004.—Some of the most recent aging tests, such as the Marzetti O test (cf. *C. A.* **17**, 2975), the aging wheel of the Office des Inventions (cf. *C. A.* **21**, 1899) and the Hanau analytical lamp (cf. Krahl, *C. A.* **21**, 2816), are described. C. C. DAVIS

Changes in composition of rubber on aging. M. SAGAJLO. *Przemysl Chem.* **12**, 184-90(1928).—Analyses of several rubber mixts. showed that on aging not only the acetone-sol. content but also the $CHCl_3$-sol. content and substances saponifiable in alc. KOH increase in the rubber. A. C. ZACHLIN

Laboratory devices for studying the aging and vulcanization of rubber. R. FRIC. *Chimie et industrie* Special No., 547-8(April, 1928).—A detailed description of a pressure oven for carrying out artificial aging tests in air or O_2 under pressure, as suggested by Bierer and Davis. Heating is obtained by induced currents. A. P.-C.

American vulcanization accelerators. RUDOLF DITMAR. *Chem.-Ztg.* **52**, 730 (1928).—The characteristics of the Am. accelerators termed in the trade *A*-11, *A*-16, *A*-19, *A*-20, *A*-50 and *Z*-88 are described briefly, including their fluorescent colors in ultra-violet light. C. C. DAVIS

A scheme for accelerator classification. R. P. DINSMORE AND W. W. VOGT. Goodyear Tire & Rubber Co. *Rubber Age* (N. Y.) **23**, 554-7(1928).—See *C. A.* **22**, 4273. C. C. DAVIS

The microscopy of the vulcanization of rubber. ERNST A. HAUSER AND M. HÜNEMÖRDER. *Caoutchouc & gutta-percha* **25**, 14146-9(1928). (Accompanying illustrations on sep. sheet.)—An *app.* is described, with which it is possible to observe continuously the changes which rubber mixts. undergo when heated. In 1 modification of the app., tiny samples are heated directly in steam, in another modification they are heated under compression indirectly by steam, in each case steam under known pressure being passed through or around the chamber contg. the sample, the latter being under observation through a microscope. By this means it was possible to observe the *behavior of S during vulcanization.* At a pressure of 3 atms., the S fused, the total mass became semi-fluid and the droplets of S dissolved in the rubber without any intermediate phase (cf. Dannenberg, *C. A.* **21**, 835, 3764). The mass then remained optically empty, but soon after the heating was stopped, droplets of S appeared in continuously increasing no. These droplets then migrated to form chains. The longer the heating the less was this tendency for S to sep. and form chains. With accelerators present, fusion of S began sooner, general softening of the mass was less, and instead of droplets forming chains, the S sepd. directly on the surface in rhombic form. The same general phenomena took place with ZnO, though softening and subsequent sepn. of S were less pronounced. Colloidal ZnO behaved somewhat similarly to S, dissolving during vulcanization and sepg. again later. The app. is applicable to the study of the *behavior of compounding ingredients in general.* A review of earlier attempts to observe change during vulcanization is included. C. C. DAVIS

Watch-case vulcanizers. JOSEPH ROSSMAN. *India Rubber World* **78**, No. 4, 67-9 (1928); cf. *C. A.* **22**, 4273.—A description, from the historical point of view, of the development of this equipment. C. C. DAVIS

Measurement of the tread movement of pneumatic tires and a discussion of the

probable relation to tread wear. W. L. HOLT AND C. M. COOK. *Bur. Standards J. Res.* **1**, 19–28(1928).—*Lab. abrasion tests* to simulate road wear should use a non-linear abrasive movement since most of the tread surface is abraded by curved motion.

C. C. DAVIS

Studies on the reason for a rubber-like condition of matter (VON VEIMARN) **2.** Rubber-bonded abrasive articles (U. S. pat. 1,687,410) **19.** Protective paint from rubber (GRAY) **26.**

Latex composition. WILLIS ALEXANDER GIBBONS (to The Dominion Rubber Co., Ltd.). Can. 282,491, Aug. 14, 1928. Natural latex is concd. to a compn. contg. over 50% solids and preserved with ammonia, H_3PO_4 is added to neutralize the alkali, without coagulating the rubber content of the latex, the water is evapd., and all the solids contained in the latex are recovered. Cf. *C. A.* **22,** 3805.

Treating rubber latex. SOCIETÀ ITALIANA PIRELLI and U. PESTALOZZA. Brit. 284,608, Jan. 31, 1927. Latex is treated at a low temp. by adding small quantities of substances such as solns. or suspensions of salts of bi- or ter-valent metals, and is then heated to effect coagulation or thickening; *e. g.*, 0.15% of a slightly sol. Ca salt and 0.1% of ZnO suspended in "ammoniacal water," may be added to ammonia-preserved latex contg. 50% of rubber. At temps. of 20° or lower no coagulation occurs but on heating to 95–97° rapid coagulation is effected. Fillers, vulcanizing agents, etc., may be added and the process may be applied to the manuf. of molded articles, extruded tubes, etc.

Jelutong product. SHELDON S. YATES (to Chicle Development Co.). U. S. 1,685,797, Oct. 2. Jelutong latex is coagulated and the coagulant is melted and water is expelled to reduce the water content below 5%; the melted mass is then poured into molds and permitted to cool and is suitable for transportation and storage. Cf. *C. A.* **22,** 1705.

Electrodeposition of rubber, etc. DUNLOP RUBBER CO., LTD., P. KLEIN and A. HEALEY. Brit. 284,736, Aug. 4, 1926. The toughness of deposits of rubber, gutta percha and the like produced from dispersions is increased by incorporating with the aq. dispersions peptizing agents such as protective colloids, *e. g.*, soft soap, in excess of the quantities normally employed for protective purposes. Soft soap 6–12 g. may be used with each l. of latex contg. 30% rubber.

Rubber emulsions. J. M. A. TOUCHON. Brit. 284,244, Jan. 25, 1927. Rubber emulsions which may be used as substitutes for natural latex are prepd. by passing a thick rubber soln. together with water contg. an emulsifying agent through a high-speed emulsifying app. and removing the rubber solvent from the emulsified product by low-temp. distn. Numerous details are given.

Rubber compositions. E. YOSHIOKA. Brit. 284,912, May 19, 1927. A "buoyant rubber" for oil hose contains factis up to 3%, S 5%, an alk. soap insol. in mineral oils and melting at the vulcanizing temp. 1, diphenylguanidine 1% and rubber over 80%.

Regeneration of rubber. WALDEMAR SCHEITLAUER. Can. 283,709, Oct. 2, 1928. Ground waste rubber is regenerated by mixing with a NaOH soln. which has been in contact with cellulosic substances as used and discharged as a waste product in the production of viscose, and treating the mixt. in autoclaves in the usual way.

Spongy rubber. R. J. NOAR. Brit. 284,938, July 19, 1927. In manuf. of sponge-rubber articles, a vulcanized skin is formed on the surface of a mass of dough before gas is generated in the mass and the whole mass is then hot vulcanized. To effect the superficial vulcanization and skin formation a cold process may be used or there may be employed a "super-accelerator" such as piperidine piperidyl dithiocarbamate or tetramethyl-thiuram disulfide at a temp. below that at which gas is generated. Various details are given.

Surface layer of sponge rubber on rubber goods. SATARO MORIMOTO. U. S. 1,685,954, Oct. 2. A soln. of unvulcanized rubber mixed with materials such as $(NH_4)_2CO_3$, S and fillers which convert ordinary rubber into spongy rubber is applied to the surface of unvulcanized rubber goods and the assembly is then cured by a hot process.

Products of rubber with metallic salts. H. A. BRUSON (to Goodyear Tire & Rubber Co.). Brit. 285,071, Feb. 11, 1927; Can. 283,757, Oct. 2, 1928. Rubber is treated with metallic salts such as $SbCl_5$, $SnCl_4$, $TiCl_4$, $FeCl_3$, or BCl_3, to form addn. products which contain a plurality of hydrocarbon mols. linked together and from which the metal salt may be split off to obtain a product thought to be a polymer of rubber. Both the addn. product and the polymer absorb O from the air.

Rubber-surfaced roads, floors, etc. J. J. HORNE and C. F. HENDRICK. Brit. 285,203, Dec. 18, 1926. Structural features.

Ornamenting rubber articles. DUNLOP RUBBER CO., LTD., AND G. W. TROBRIDGE. Brit. 285,113, Oct. 14, 1926. Bathing caps or other rubber articles formed by electrophoretic deposition are treated in a press with heated embossed, engraved or stamped plates during or prior to vulcanization.

Apparatus for making rubberized cord sheet material. JOHN W. CLARK. U. S. 1,686,436, Oct. 2.

Tightening means for re-rubbering or molding pneumatic tires. MICHEL LAMOUROUX. Fr. 635,944, June 14, 1927.

Sulfurized oil compositions. A. DE WAELE. Brit. 284,415, Nov. 3, 1926. Vulcanized oil compns. are made by treating with S chloride, S thiocyanate, dithiocyanogen (or similar vulcanizing agent reacting energetically with glycerides of hydroxy unsatd. fatty acids) an ester of an unsatd. higher fatty acid in which one of the H atoms of the fatty acid residue is substituted by an electronegative atom or group which is less electronegative than the OH group, *e. g.*, Cl or the acetyl, formyl or carbonate group, *e. g.*, acetylated castor oil or acetylated oxidized or blown oils. Fillers and other substances may also be added.

Vulcanizing rubber. LORIN B. SEBRELL (to The Goodyear Tire and Rubber Co.). Can. 282,883, Aug. 28, 1928. A mixt. of rubber, a vulcanizing agent and a zinc salt of 1-mercapto-3,5-dimethylbenzothiazole is heated. Cf. *C. A.* **22,** 3806.

Vulcanized rubber. VULTEX, LTD. Ger. 462,858, June 28, 1928. Addn. to Ger. 391,635. Previously concd. latex of over 55% concn., preferably 60-70%, is vulcanized with the usual fillers, accelerators, etc.

Hot vulcanization of rubber. B. V. BUIZOV. Russ. 3831, Oct. 31, 1927. Alkali salts of trithiocarbonic acid are added to a mixt. of rubber, S and the customary ingredients in a rubber mass. The mixt. is then vulcanized as usual.

Hot vulcanization of a rubber mixture. B. V. BUIZOV. Russ. 3832, Oct. 31, 1927. Complex NH_3 salts of Ni, Cr, Cu and Co are added to a mixt. of rubber, ZnO, coloring compds. and fillers. This mixt. is vulcanized hot as usual.

Treating waste vulcanized rubber. DUNLOP RUBBER CO., LTD., D. F. TWISS and F. THOMAS. Brit. 284,829, Dec. 20, 1926. Comminuted scrap is admixed with S and with an "anti-ager" such as quinol, aminophenol aldol α-naphthylamine or other condensation product of the aldehydes and aromatic amines (suitably 1% each of the S and "anti-ager") and then subjected to heat and pressure (suitably in a "daylight press" for 30 min. at 150°).

Apparatus for molding and vulcanizing small rubber articles. DUNLOP RUBBER CO., LTD., H. WILLSHAW AND T. NORCROSS. Brit. 285,103, Oct. 7, 1926.

Molding and vulcanizing tires. J. R. GAMMETER (to B. F. Goodrich Co.). Brit. 285,359, Feb. 14, 1927. A plastic mixt. which may be formed of clay 100, water 40-50, and waterglass 1-2 parts is used for distending tires before vulcanization. An app. and various mech. details are described.

Apparatus for vulcanization of rubber. THE LIVERPOOL RUBBER COMPANY. Fr. 636,067, June 16, 1927.

Leather substitute. GOVERNMENT RUBBER TRUST "REZINOTREST." Russ. 4159, Sept. 15, 1924. Known accelerators of vulcanization, such as aliphatic hydroaromatic or heterocyclic amines or their salts or derivs. of dithiocarbamic acid, are added to a finely divided mixt. of rubber and leather, sulfur and oxides of the metals Ca, Mg, Zn, Pb, etc. This mixture is heated for the purpose of vulcanization at not over 110°.

CHEMICAL ABSTRACTS

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I. AUTHOR INDEX

("P" before a page number indicates "Patent")

NOTE.—In the transliteration of names originally written in Russian, the system followed so far as possible is that of *Nature* **41**, 396–7(1890), in which *v* is used instead of the *w* or *ff* of other spellings, *sh* instead of *sch*, *ch* instead of *tsch*, *i* instead of *j* or *y*, etc. Thus Pavlov, not Pawlow; Chugaev, not Tschugaeff. To make quite sure, users of the index should in such a case look under both spellings.

SUBJECT INDEX

KEY

In using this index the following should be borne in mind:

1. **Subjects,** not words, have been indexed.

2. **Abstracts,** not merely their titles, have been considered in indexing.

3. The small **superior numeral** which accompanies each page number designates the fraction of the page in ninths in which the subject being indexed is first considered. The printed matter only, exclusive of page headings, has been thus subdivided.

4. "P" before a page number indicates that the abstract is of a **patent.**

5. The **alphabeting of index headings** has been done on the basis of that part which comes before the comma in such headings as *Copper, metallurgy of* and *Phenol, p-nitro-*. *E. g.*, these headings come before the headings *Copper compounds* and *Phenol condensation products*, respectively.

6. **Organic compounds** are indexed on the basis of "parent compounds," or more accurately, "index compounds" (see Introduction), the names of substituent radicals following in alphabetical order. The system of naming organic compounds which has been used is outlined in the Introduction below. Esters and salts of organic acids are, in general, indexed under the names of the acids; notes in the index under the appropriate headings explain the few exceptions.

7. An **asterisk** (*) following the name of an organic compound entered in the index signifies that the name, or numbering, or both are the author's own and may not conform to the system of nomenclature used in this index. This sign is used where it has seemed inadvisable, owing to incomplete information, to attempt to make the name conform to the system, or where the author's name, differing widely from the one given to the compound by the indexer, is given as an extra entry.

8. A **dagger** (†), which follows the names of a few compounds, signifies that the entry is an extra one, the name being only slightly less favored than the one chosen for the other entry. The preferred name can be determined by reference to the Formula Index.

The desirability of making the index readily usable without the need of reference to an elaborate introduction has been held constantly in mind. Although an introduction seems desirable and should be helpful, nevertheless the index is dependent neither on the Key nor on the Introduction. Numerous cross references are given throughout the index, and notes appear in connection with certain headings. An examination of the Introduction, which follows, should be especially helpful to those interested in looking up organic compounds.

INTRODUCTION

General policy. The indexing of subjects, as opposed to word-indexing, has been emphasized. This avoids omissions, scattering and unnecessary entries; with the abundant cross-references used it means that one should be able to find all of the references on any subject with certainty and with a minimum of effort. The words used as subject headings or in modifying phrases are not necessarily to be found in the abstracts but an expression of the idea suggested will be found within or beginning in the ninth of the page designated by the small superior numeral following the page number. Chemical compounds have been named and entered systematically; the system used is outlined below. All new compounds and all elements, compounds and other substances for which new data are given have been indexed, with the single exception of new compounds for which no names or structures have been given. Such compounds are entered only in the Formula Index. The Subject Index is in no other respect altered because of the Formula Index.

Modifying phrases. In writing such phrases for the entries under any heading the words have been arranged so that the idea considered to be the most important is expressed at the beginning whenever feasible and this procedure, as well as the selection of the words for this purpose, has been governed by numerous formulated general principles and specific rules. *E. g.*, "detection of" has been used consistently whenever correct at the beginning of the modifications in indexing subjects treated from a qualitative analytical point of view, instead of permitting a scattering under such additional phrases as "test for," "reaction for," etc., regardless of what words may have been used in the text. In the case of appropriate headings the selection of first words for modifications has been made on the basis of a definite system of classification. Under a few large headings two or more entries have been made on indexing a subject in a single abstract in case two or more ideas could be used equally well to start the modifying phrase. In alphabeting modifying phrases prepositions at the beginning have been ignored.

References to fractions of the page. One can readily estimate ninths of a page with considerable accuracy by placing the fore or middle finger one-third of the distance from the top of the printed matter on the page and the thumb one-third of the distance from the bottom, a procedure very easily carried out.

Inorganic compounds. Simple inorganic compounds are entered under the usual names. In indexing compounds of iron, gold, copper and tin such headings as *Iron sulfates*, under which the "ous" and "ic" salts are entered, have been used rather than headings beginning with "ferric(ous)," "auric(ous)," "cupric(ous)," or "stannic(ous)." Acid salts, such as NaH_2PO_4, are entered under such headings as "*Sodium phosphates*." With the exception of a few common compounds, such as carbon dioxide and carbon monoxide, compounds of a given element with another or with a definite radical, which differ only in valence relations, are grouped. *E. g.*, the various oxides of nitrogen are grouped under the heading "*Nitrogen oxides*" and classified there Complex inorganic compounds which cannot be given definite names satisfactory for indexing are usually indexed under the heading which represents the class of compounds concerned and under a heading beginning with the name of the significant element. *E. g.*, dichlorotetraamminecobaltic chloride would be indexed under "*Ammino compounds*" and under "*Cobalt compounds*." The Formula Index, which follows the Subject Index, should be particularly helpful in locating complex compounds.

Organic compounds. The system used for naming and indexing organic compounds is the same as that in use starting with the 1916 volume. An explanation of it by Austin M. Patterson and Carleton E. Curran, who are its originators, has appeared in another

journal of the Society.[1] The system is based on existing usage and follows this as far as is practicable, so that a great many familiar names are unaffected. Only the general principles will be given here, but in the index itself will be found abundant cross references and also notes under *Alcohols, Ketones,* etc., indicating how compounds of these classes are named.

1. The "chief function" of a compound is expressed *in the main part of the name* wherever possible, and not as a substituent, thus: Pyrrolecarboxylic acid, not carboxypyrrole; ethyl alcohol or ethanol, not hydroxyethane; pentanone, not ketopentane.

2. In compounds of mixed function, the chief function is determined from the following order of precedence:[2] *"onium" compounds, acid* (carboxylic first), *acid halide, amide, imide, aldehyde, nitrile, ketone, alcohol, phenol, mercaptan, amine, imine, ether, sulfide* (and *sulfoxide* and *sulfone*). Thus, hydroxybenzonitrile, not cyanophenol; aminophenol, not hydroxyaniline.

3. A multiple chief function is expressed where feasible as -diol, -dicarboxylic acid, etc., rather than as hydroxy—ol, carboxy—acid, etc. But amino and imino groups attached to cyclic bases are treated as substituents; as, aminopyridine.

4. The index compound should be as large, and the substituents as small, as is practicable in conformity with the above rules; as, ethylbenzene, not phenylethane. But such names as diphenylethane and triphenylcarbinol are exceptions. When the chief function is in a side chain attached to a complex nucleus, "additive" names are preferred in order to harmonize 1 and 4; thus, naphthaleneacetic acid, not naphthylacetic acid (with the result that the compound is indexed with other naphthalene derivatives instead of under acetic acid; see 5).

5. The main part of the name with its functional ending, if any, is placed *first* in the index, the names of substituents following; thus, chloroacetic acid would appear in the index as *Acetic acid, chloro-* and dihydroxyanthraquinone as *Anthraquinone, dihydroxy-*. The part thus placed first is called the "index compound"; it may or may not be the "parent compound" (in the second example the parent compound is anthracene).

6. Names in which two functions are expressed in the index compound, as propanolone, cyclopentanonecarboxylic acid, are avoided, except that a few very common ones, such as phenolsulfonic acid, are used (indicated by cross-references).

7. The names of the substituent radicals in the name of a compound are arranged *in alphabetical order;* as, *b*enzyl*e*thyl*m*ethyl*p*henylammonium chloride. The number of radicals of each kind does not affect the order (*e. g., benzyl* precedes *ethyl* no matter how many of each are present); but the compound name of a substituted radical is treated as a unit with its own alphabetic position; thus *dimethylamino,* Me_2N-, follows *benzyl* but precedes *ethyl.* When the complete name has been formed, it is alphabeted as any other word.

8. Parentheses, brackets and even braces are used where necessary to mark off complex radical names.

9. Familiar methods of numbering are employed (Greek letters for acids, alcohols, etc., and for side chains; arabic numerals for Geneva names and rings). The numbering of complex nuclei is shown in the index under the parent compounds; it is practically identical with that of Richter's "Lexikon" so far as that work goes. For the more recently discovered forms the "Proposed International Rules for Numbering Organic Ring Systems"[3] have been adopted as a standard.

10. When two or more numberings are equally indicated that one is chosen which

[1] Patterson and Curran, *J. Am. Chem. Soc.*, **39**, 1623–38(1917).

[2] This order is an attempt to express, not the relative chemical importance of functions, but general usage in selecting one of them for the ending of the name.

[3] Patterson, *J. Am. Chem. Soc.*, **47**, 543–61(1925).

gives the smallest number or numbers for the *chief function, then for double bonds* if these must be regarded, *then for triple bonds, then for point of attachment* (doubled molecules), *then for substituents.*

11. Unnecessary numbers are avoided: thus, in Δ^3-1-cyclohexanol the 1 is not needed because by the rules in paragraph 10 the OH group is assumed to be in position 1.

12. Numbers in parentheses are used to indicate the position of entering hydrogen necessary to the existence of the compound; thus, 4(3)-quinolone is equivalent to 3, 4-dihydro-4-ketoquinoline.

13. Doubled molecules or radicals are indicated by names commencing with *bi-* (as, *o,o'*-biphenol, biphenyl, $\Delta^{4,4'}$-bipiperidine). *Bis-* is used for like molecules united by a bivalent radical and for double complex expressions; as, methylenebisphenol, bis(dimethylamino)-.

In using the *cross references*, the *general* nature of many of them should be kept in mind; thus, the reference "*Benzene, ethoxy-*. See *Phenetole*" is applicable not only to this compound itself but to derivatives, which are indexed under it rather than under *Benzene*.

ORGANIC RADICALS

An extensive list of preferred names for organic radicals was given in the 1927 Index in a place corresponding to this and also in the Introduction of the Second Decennial Subject Index. With few exceptions they are the ones in common use. Attention is here called merely to the preferred names for some radicals having more than one name in the literature and to some radical names recently adopted.

BY NAMES

acenaphthenyl $C_{12}H_9$—
acetyl CH_3CO—
acridyl $C_{13}H_8N$—
acrylyl $CH_2{\cdot}CHCO$—
amyl C_5H_{11}—
anisal *p*-$MeOC_6H_4CH$:
arsono $(HO)_2OAs$—
arsyl H_2As—
arsylene HAs:
asaryl 2,4,5-$(CH_3O)_3C_6H_2$—
benzal C_6H_5CH:
benzenyl $C_6H_5C\vdots$
benzilyl $Ph_2C(OH)CO$—
benzofuryl C_8H_5O—
benzohydryl Ph_2CH—
boryl O.B—
1,4-butylene—$(CH_2)_4$—
camphanyl (*from camphane*) $C_{10}H_{17}$—
camphoroyl (*from camphoric acid*) $C_8H_{14}(CO)_2$·
camphoryl (*from camphor*) $C_{10}H_{15}O$—
camphorylidene (*from camphor*) $C_{10}H_{14}O$:
carbamido H_2NCONH—
carbamyl H_2NCO—
carbethoxy EtOOC—
carbomethoxy MeOOC—
carbonyl OC=
carbyl —C—
cetyl $Me(CH_2)_{15}$—
cinnamal PhCH:CHCH·
citral (*from citraldehyde*) $C_9H_{15}CH$:
cresotyl (*from cresotic acids*) $(OH)(CH_3)C_6H_3CO$-2,3—, etc.).
cresyl $(OH)MeC_6H_3$—
cumal *p*-$Me_2CHC_6H_4CH$:
epoxy —O—
ethinyl $HC\vdots C$—
ethinylene —$C\vdots C$—
ethylene —CH_2CH_2—
fenchyl (*from fenchyl alcohol*) $C_{10}H_{17}$—
fluorylidene (*from fluorene*) $C_{13}H_8$:
formyl OHC—
fural C_4H_3OCH.
furyl C_4H_3O—
furylidene (*2 isomers*) $\overline{\underset{4}{CH}\ \underset{5}{CH}\ \underset{1}{O}.\underset{2}{CH_2}\ \underset{3}{C}}$·
guanido $H_2N.C(.NH).NH$—
guanyl $H_2N.C(.NH)$—
hippuryl $PhCONHCH_2CO$—
indylidene (*from indole*) C_8H_7N.
isonitro HOON:
isonitroso HON:
isopropenyl $MeC(.CH_2)$—
keto O.
mercapto HS—
mesityl (*from mesitylene*) 3,5-$(CH_3)_2C_6H_3CH_2$—
methionyl —$SO_2CH_2SO_2$—
naphthal $C_{10}H_7CH$:
naphthylidene $C_{10}H_8$.
oxy —O—
perthio (*replacing O only*) S:S:
pheracyl $PhCOCH_2$—
phenacylidene PhCOCH:
phenanthrylene (*from phenanthrene*) $C_{14}H_8$:
phenylenedisazo —$N{:}NC_6H_4N{:}N$—
phthalidene (*from phthalide*) $\overline{C_6H_4CO.OC}$=
phthalidyl (*from phthalide*) $\overline{C_6H_4CO.O.CH}$—
piperonyl 3,4-$(CH_2O_2)C_6H_3.CH_2$—
pivalyl (*from pivalic acid*) $(CH_3)_3CCO$—
propenyl MeCH:CH—
propenylidene $CH_3CH{:}C$:

RING INDEX

The following index of *ring complexes* is arranged as shown by the bold-face figures: Class I, with single figures indicating simple rings of 3, 5, etc., members; Class II, two figures denoting double rings of 3 and 4, 3 and 5, etc., members; then the triple and still more complex rings. Under each combination of figures the kind and number of atoms in the ring or rings are expressed in formulas. These formulas are arranged so that their initial rings are in the same order as in the Formula Index (see Key at the beginning of it). If the initial rings are alike the second rings of the formula are considered, and so on. By this means the reader will be able to learn the name used in the index for the simplest parent compound containing any particular ring or combination of rings and by turning to this name in the index he will find the compounds listed and, perhaps, cross references to names of derivatives. Rings which are united but which have no atoms in common (*e. g.*, biphenyl) and "spiro" compounds[1] which are characterized by two rings having but one atom in common are not regarded as ring complexes nor included in this index

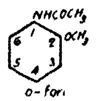
To illustrate: **6,6,6,** C_4N_2-C_6-C_6 Benzophthalazine
Phenazine

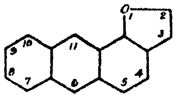
This designates (1) a ring system of three components, each of six members; (2) the first is heterocyclic, containing four carbon atoms and two nitrogen atoms and the other two are carbocyclic rings of six atoms each; (3) parent compounds of this configuration will be found in the index under the two names given. If derivatives are indexed a structural formula will be found with the proper numbering and also appropriate cross references to derivatives having other common names, if any such are in the index.

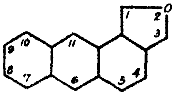
It should be noted that the classification is made with reference to the number of smallest rings which, placed together, will constitute the plane formula. Thus hexamethylene tetramine is treated as a 6,6,6 complex although a fourth six-membered ring (composed of atoms from the three six-membered rings) is also present.

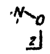
1-RING SYSTEMS

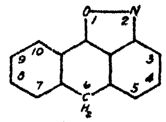
[1] All members of this class will be found together under "Spiro-" in the Subject Index


NHCOCH3
OCH3
1
2
3
4
5
6
o-form

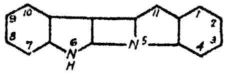

2,3-α-

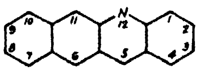

3,4-α-



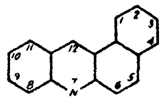


1,6 - meso -

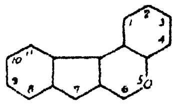


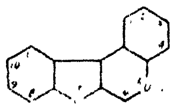


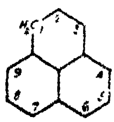
2,3-

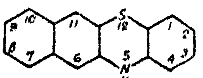


3,4-

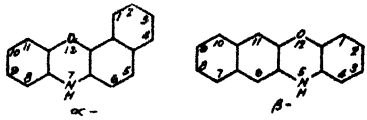




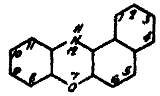




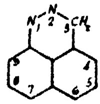
β-



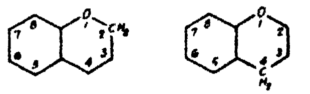
α- β-



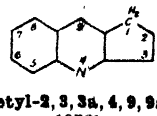
γ-

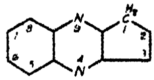


3-peri-

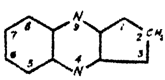


1,2- 1,4-

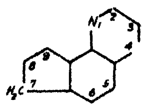




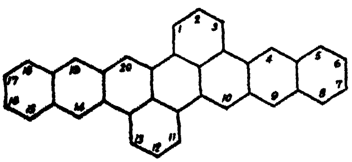
1—[β]



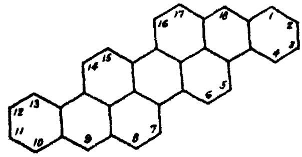
2—[β]



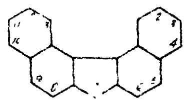
-[Z]

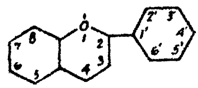


[2,3-εζ]



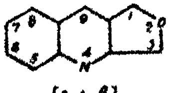
[3, 2, 1 - γ δ, μ ν]

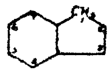


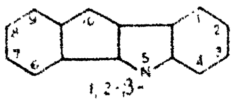


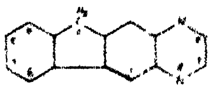

[3,4-β]


[3,4-γ]


[3,4-β]







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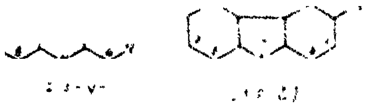
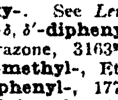
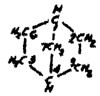
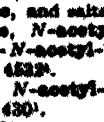
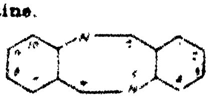
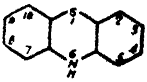


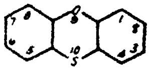


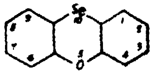


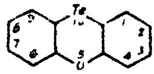


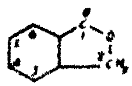


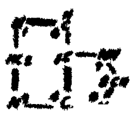




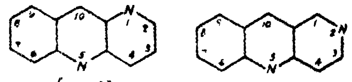




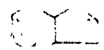




(1)



[3,2-β] [4,3-β]



(4,5-b)

p-p- *o-p-*

ABBREVIATIONS USED IN CHEMICAL ABSTRACTS.

[α] specific rotation ($[\alpha]^{20}_{D}$, for 20° and sodium light)
abs. absolute
Ac acetyl (AcH, acetaldehyde; AcOH, acetic acid)
a. c. alternating current
addn. addition
addnl. additional
alc. alcohol
alk. alkaline (not alkali)
alky. alkalinity
Am amyl
amp ampere(s)
amt. amount
anhyd. anhydrous
app. apparatus
approx. approximate, approximately
aq. aqueous
assoc. associate(s)
assocd. associated
assocn. association
at atomic (not atom)
atm. atmosphere(s), atmospheric
at. wt. atomic weight
av. average (except as a verb)
b. (followed by a figure denoting temperature) boils at, boiling at (similarly b_{13}, at 13 mm. pressure)
bacteriol. bacteriological
b. p. boiling point
B. t. u. British thermal unit(s)
Bu butyl (normal)
Bz benzoyl (BzH, benzaldehyde; BzOH, benzoic acid)
cal. calorie(s)
calc. calculate
calcd. calculated
calcg. calculating
calcn. calculation
cc. cubic centimeter(s)
c. d. current density
chem. chemical (not chemistry)
cm. centimeter(s)
coeff. coefficient
com. commercial
compd. compound
compn. composition
conc. concentrate
concd. concentrated
concn. concentration
cond. conductivity
const. constant
contg. containing
cor. corrected
c. p. candle power
c. P. chemically pure
crit. critical
cryst. crystalline (not crystallize)
crystd crystallized
crystn. crystallization
cu. m. cubic meter
d. density (d_{13}, specific gravity at 13° referred to water at 4°; d^{20}_{20}, at 20° referred to water at the same temperature)
d. c. direct current
decompn. decomposition
deriv. derivative
det. determine
detd. determined
detg. determining
detn. determination
dil. dilute
diln dilution
dissoc. dissociate(s)
dissocd. dissociated
dissocn. dissociation
distd distilled
distg. distilling
distn. distillation
elec. electric, electrical
e. m. f. electromotive force
equil. equilibrium
equiv. equivalent
est. estimate
estd. estimated
estg. estimating
estn. estimation
Et ethyl (Et_2O, ethyl ether)
evap. evaporate
evapd evaporated
evapg evaporating
evapn. evaporation
examd. examined
examg. examining
examn. examination
expt. experiment
exptl. experimental
ext. extract
extd. extracted

extg. extracting
extn. extraction
f. p. freezing point
ft. foot, feet
g. gram(s)
h. p. horsepower
hr. hour
in. inch(es)
inorg. inorganic
insol. insoluble
kg. kilogram(s)
kw. kilowatt(s)
l. liter(s)
lab. laboratory
lb. pound(s)
m. meter(s); also (followed by a figure denoting temperature) melts at, melting at
manuf. manufacture
math. mathematical
max. maximum
Me methyl (MeOH, methanol)
mech. mechanical
mfg. manufacturing
mg. milligram
min. minimum (also minute(s))
mixt. mixture
mol. molecule, molecular
mol. wt. molecular weight
m. p. melting point
n index of refraction (n_D^{20}, for 20° and sodium light)
N normal
neg. negative
no. number
org. organic
p. d. potential difference
pharmacol. pharmacological
phys. physical
physiol. physiological
pos. positive
powd. powdered
p. p. m. parts per million
ppt. precipitate
pptd. precipitated
pptg. precipitating
pptn. precipitation
Pr propyl
prep. prepare
prepd. prepared
prepg. preparing
prepn. preparation
qual. qualitative
quant. quantitative
recrystd. recrystallized
resp. respectively
r. p. m. revolutions per minute
sapon. saponification
sapond. saponified
sapong. saponifying
sat. saturate
satd. saturated
satg. saturating
satn. saturation
sec. second(s)
sep. separate
sepd. separated
sepg. separating
sepn. separation
sol. soluble
soln. solution
soly. solubility
sp. specific
sp. gr. specific gravity
sq. cm. square centimeter(s)
sym. symmetrical
temp. temperature
U. S. P. United States Pharmacopeia
v. volt(s)
vol. volume (not volatile)
w. watt(s)
w. p. c. watts per candle
wt. weight

III. FORMULA INDEX

KEY.

In using this index the following should be borne in mind:

1. The Formula Index is **supplementary** to the Subject Index; in no sense does it replace any part of the latter except that most of the organic compounds that were not named in the original papers are entered in the former only.

2. **Inorganic as well as organic compounds** have been entered.

3. **Entries under their own formulas** are made for all strictly inorganic and strictly organic compounds and for the true organic derivatives of organic compounds, both addition compounds and true reaction derivatives (this includes esters, hydrazones, methohalides, oximes, picrates, semicarbazones, etc.). Inorganic salts of organic acids and inorganic addition compounds of organic compounds (hydrohalides, chloroplatinates, perchlorates, sulfates, etc.) are not given separate entries but are indicated in modifying phrases under the formulas of the compounds from which they are derived (under the acid in the case of a salt). Salts of formic, acetic and oxalic acids are exceptions; these are entered as such.

4. The **arrangement of symbols in formulas** is alphabetical except that in carbon compounds C always comes first, followed immediately by H if hydrogen is also present.

5. The **arrangement of formulas** is also alphabetical except that the number of atoms of any specific kind influences the order of compounds. *E. g.*, all formulas with 1 C come before those with C_2, thus: CCl_2O, CCl_4, $CHCl_3$, CHN, CHNO, CH_2Br_2, CH_2O, CH_3Cl, CO, C_2Ca, $C_2H_4O_2$.

6. The **arrangement of entries under any heading** is strictly alphabetical according to the preferred names of the isomers.

7. **Entries consist of** (*a*) the formula (in bold-face type), (*b*) the name as it has been entered in the Subject Index (in light-face Roman type; *it should be noted particularly that the part of the entry in this type is the exact equivalent of the formula given*), (*c*) occasionally a modifying phrase or word such as "Ca salt" or "hydrochloride" (in italics, different type being used to set off that part of a compound being indexed which is not represented in the formula used; see ¶ 3 above), (*d*) the page reference and (*e*) the fraction of the page in ninths (indicated by a small superior numeral) in which the compound will be found.

8. **Cross-references** are to the Subject Index.

9. **Water of hydration** is not made a part of the formulas indexed but is usually given in light-face type following the formulas.

10. **Polymers** having different names and recognized as different substances, *e. g.*, acetaldehyde and paraldehyde, are all entered under their accepted formulas. But definite compounds for which different polymeric formulas are in use are entered under the simplest formula only with cross-references under the polymeric formulas.

11. **A straight line,** thus—, used under some headings to avoid repetition of names, always stands for the name of the "index compound," *i. e.*, that part of the preceding name (inverted) which comes before the comma.

12. "P" before a page number indicates that the abstract is of a **patent.**

13. The **names beryllium** (Be), **columbium** (Cb) **and hafnium** (Hf) are given preference over glucinum (Gl), niobium (Nb) and celtium (Ct), respectively, for these elements.

The Key to a formula index is necessarily lengthy. It would not be correct to conclude from this that this index is difficult to use. Experience is to the contrary.

INTRODUCTION.

General purpose and policy. The location of chemical compounds in an index by names is at times uncertain because names vary and in the case of complex compounds may be difficult to ascertain. New compounds are constantly being prepared, which, if named at all, may receive more than one name which is justified from one point of view or another and the possibilities of incorrect names are great. Since the kinds and number of component atoms of a chemical compound are unvarying characteristics the supplementary Formula Index to *Chemical Abstracts* is published for the purpose of eliminating this element of uncertainty in the Subject Index. Except that many unnamed compounds are no longer entered under the heading "Compound," the Subject Index is in no way altered on account of the Formula Index. In the Subject Index related compounds are *grouped* rather effectively and to good use by the present system of indexing on the basis of "parent compounds" or more accurately "index compounds"; in the Formula Index the certain location of *individual* compounds is the primary consideration. The Subject Index is more convenient to use in some respects and it frequently contains more information in the form of modifying phrases. The repetition of modifying phrases in the Formula Index beyond necessary brief phrases to indicate derivatives has been avoided as unnecessary for the accomplishment of the real purpose of this index, as stated above, and as inconsistent with necessary economy. Isomerism is not indicated in the Formula Index in cases in which the names differ only in position numbers or letters but it always is in the Subject Index when known. Ready reference to the Subject Index for the purpose of locating information regarding related compounds is made possible by the use in the Formula Index of names following the formulas written exactly as they appear in the former index.

All new compounds and all compounds for which new data are given have been entered. Most of the compounds have been entered under their own formulas. Some departure from a policy of making separate formula entries for derivatives of all kinds is reasonable and accords with custom. The only departures in this index (see ¶3 of the

Key) have been in classes of compounds the nature of which would be more than likely apparent to the investigator. The interest in a salt of a complex organic acid, for example, is likely to be mainly in the acid and it is considered more valuable to have the record of it under the formula of the acid for the use of searchers looking up that acid.

In the case of unnamed organic compounds, where possible, the class, as acid, source and melting or boiling point have been given.

Cross-references to the Subject Index have been used for all simple inorganic compounds, for all minerals of definite composition and for the organic compounds more commonly met with, in general whenever it seemed likely that users of *Chemial Abstracts* would predominatingly refer to the Subject Index.

The system. The system, as described in the Key, is, with slight modifications, that worked out by Dr. Edwin A. Hill[1] and used by the Classification Division of the U. S. Patent Office. This system is preferred to the system of Richter's Lexikon because of its greater simplicity and its applicability with equal fitness to inorganic as well as to organic compounds.

[1] *J. Am. Chem. Soc.*, 22, 478–94(1900).

bis[*N*, *N*-dimethyl-, bromide perchlo te, 3149[4].

$C_{18}H_{22}BrNO_2$ 5-Bicyclo[0.1.2]pentanone, 1 ry-droxy-2,2,3,3-tetramethyl-, *p*-bromo zyl deriv., oxime, acetyl deriv., 195

$C_{18}H_{22}Br_2N_2O_2$ 3 - Pyrrolepropionic acid, 2 - (bromomethyl) - 5 - {[5 - (bromometh l) - 3 - ethyl - 4 - methyl - 2 - isopyrrylid e]-methyl}-4-methyl-, - *HBr*, 2569[1].

$C_{18}H_{22}Br_4N_2$ Aniline, *p*, *p'*-vinylidenebis[*N N*-dimethyl-, tetrabromide, 3149[4].

$C_{18}H_{22}I_4N_2$ Aniline, *p*, *p'*-vinylidenebis[*N*, di-methyl-, tetraiodide, 3149[4].

$C_{18}H_{22}N_2$ Cyclopentanenitrile, 1-(1,2,3,4,4 a-hexahydro-9-carbazyl)-, 3659[4].

$C_{18}H_{22}N_2O$ Phenetole, 2-isopropyl-5-meth -?-phenylazo-, 3842[4].

$C_{18}H_{22}N_2O_2$ (See also *Holocaine.*)
Anthranilic acid, *N*-(*p*-diethylaminophen)-, Me ester, 1582[1].

$C_{18}H_{22}N_2O_4$ 3-Pyrrolepropionic acid, 2-(ani no-methyl)-5-carbethoxy-4-methyl-, 13 .

$C_{18}H_{22}N_2O_4S_4$ *p*-Dithiane, 1,1,4,4-tetrah ro-1,4-bis(*p*-tolylsulfonylimino)-, 1325[3].

$C_{18}H_{22}N_2O_6$ 4-Isopyrrolecarboxylic acid, 2- (4-carboxy - 3 - hydroxy - 5 - methyl - 2 - pyrryl)methylene] - 3 -1-, di-Et ester, 4128[1].
Pilocarpine, salicylate, 786.
2,4 - Pyrroledicarboxylic a id, 5 - (anili o-methyl)-3-(hydroxymethyl)-, di Et ester, 2942[8].

$C_{18}H_{22}N_2O_5S$ Glycine, *N*-(*N*-2-naphthylsulfonyl leucyl)-, 1758[1], 2577[1].
Leucine, *N*-[*N*-(2-naphthylsulfonyl)glycyl]-, 2577[1].

$C_{18}H_{22}N_4$ Dye, m. 300°, from 5-isopropyl-2-*p*-tolylenediamine and *p*-ONC$_6$H$_4$NMe$_2$, 3148[3].
Tetrazane, 1,4 - diisopropylidene - 2,3 - di-phenyl-, 1337[8].

$C_{18}H_{22}N_4NiO_4$ Butyric acid, *α*-keto-, oxime, complex Ni salt, pyridine compd., 578[3].

$C_{18}H_{22}N_4O_2$ Biurea, 1,6-bis(*α* methylbenzyl)-, 3640[6].

$C_{18}H_{22}N_4O_4$ Acetamidine, *N*-phenyl-, oxalate, 222[5].

$C_{18}H_{22}N_4O_8$ Δ^2-3-Pyrrolinecarboxylic acid, 1,1'-ethylenebis[4,5 - diketo - 2 - methyl -, di-Et ester, 5,5'-dioxime, 221[2].

$C_{18}H_{22}O$ Benzohydrol, *α*-(*α*-ethylpropyl)-, 3154[4].
1-Butanol, 2-ethyl-1,2-diphenyl-, 3154[4].

$C_{18}H_{22}O_2$ Acetaldehyde, diphenethyl acetal, 383[7].
1,2-Butanediol, 2-benzyl-3-methyl-1-phenyl-, 2937[6].
Hexane, 1,6-diphenoxy-, 3131[8].
Hydrobenzoin, *α*-isobutyl-, 3407[7].
1,2-Pentanediol, 2-benzyl-1-phenyl-, 585[9], 2937[6].
—, 4-methyl-1,1-diphenyl-, 3407[8].

$C_{18}H_{22}O_3$ Cyclohexanecarboxylic acid, 5-benzal-4-keto-2,2,3-trimethyl-, Me ester, 60[4].

$C_{18}H_{22}O_4$ Benzohydrol, 2,6-diethoxy-4-methoxy-, 3409[7].

$C_{18}H_{22}O_6$ Carene-*β*-glycol, acid phthalate, 1969[1].

$C_{18}H_{22}O_{11}$ Glucosecycloacetoacetic acid, tetra-acetate, 1140[9].

$C_{18}H_{22}Cl_6O_6$ Glutaric acid, *α*,*γ*-bis(*β*-hydroxy-*α*,*α* - dimethylbutyryl) - *β* - (trichloro-methyl)-, di-*γ*-lactone, 2560[6].

$C_{18}H_{23}NO$ Benzohydrol, *α*-(*α*-aminoisoamyl)-, and -*HCl*, 2636[1].

1 - Naphthaleneëthanol, *α* - (1 - piperidyl-methyl)-, and -*HCl*, 4522[9].
Δ^3,^{α}-Sabinaneacetanilide, 393[3].

$C_{18}H_{23}NO_2$ (See also *Lobeline.*)
Camphor, 3-(benzamidomethyl)-, 779[3].
1-Piperidineëthanol, *α*-(naphthoxymethyl)-, and -*HCl*, 4523[1,2].

$C_{18}H_{23}NO_3$ Pseudothebainone, dihydro-, 965[4].
Thebainone, dihydro-, 964[6].

$C_{18}H_{23}NO_4$ Norhyoscyamine, acetyl-, 430[1].

$C_{18}H_{23}NO_5$ Phenol, *p*-2-camphanylideneamino-, oxalate, 408[6].

$C_{18}H_{23}N_3O$ Furan, 2,3-camphylidene-2,3-dihy-dro-5-phenyl-, semicarbazone, 67[9].

$C_{18}H_{23}N_3O_2$ Benzoic acid, 5-amino-2-(*p*-diethyl-aminoanilino)-, Me ester, 1582[1].
Camphor, *β*-benzoyl-, monosemicarbazone, 67[9].

$C_{18}H_{23}N_3O$ Semicarbazide, 1-*sec*-butyl-2-phenyl-1-phenylazomethyl-, 1337[4].

$C_{18}H_{23}N_3O_2$ 1,2,3-Triazole-4,5-dicarboxylic acid, 1-(2,5-xylyl)-, bis(isopropylidenehydra-zide), 3411[2].

$C_{18}H_{24}$ Δ^2-Bicyclo[1.1.3]heptene, 7,7-dimethyl-2-(*γ*-phenylpropyl)-, 1575[6].
Naphthacene, 1,2,3,4,4a,5,7,8,9,10,12,12a-dodecahydro-, 1587[2].
Triphenylene, dodecahydro-, 432[6].

$C_{18}H_{24}CoN_{11}O_{11}$, 551[2].

$C_{18}H_{24}N_2O$ Cyclopentanecarboxamide, 1-(1,2,3,-4,4a,9a-hexahydro-9-carbazyl)-, 3659[4].

$C_{18}H_{24}N_2O_2$ 3-Pyrrolepropionic acid, 5-[(3-ethyl-4,5 - dimethyl - 2 - isopyrrylidene)methyl] 2,4-dimethyl-, -*HBr*, 2569[1].

$C_{18}H_{24}N_2O_2$ Thebainol, oxime, 430[6].

$C_{18}H_{24}N_2O_6$ 3-Pyrrolecarboxylic acid, 1,1'-ethyl-enebis[4-hydroxy-2-methyl-, di-Et ester, 221[2].

$C_{18}H_{24}N_4O_7$ Pyridine, 1,2,3,6-tetrahydro-4-iso-propenyl 2,2,6,6-tetramethyl-, picrate, 1592[1].

$C_{18}H_{24}N_4O_8$ Cyclohexanone, 2 - (1 - piperidyl-methyl)-, picrate, 591[7].

$C_{18}H_{24}O$ Acetophenone, *α*-(2-*p*-menthylidene)-, 1576[1].
Carvomenthol, 2-phenylethinyl-, 1575[8].
5-Naphthacenol, 1,2,3,4,6,6a,7,8,9,10,10a,11-dodecahydro-, 1587[2].

$C_{18}H_{24}O_3$ Ammoresinol, 2437[9].
Carvomenthone, 3-(hydroxymethyl)-, ben-zoate, 2935[9].

$C_{18}H_{24}O_4$ Phthalic acid, monomenthyl ester, 3156[6].

$C_{18}H_{24}O_{11}$ Primeveroside of salicylic acid, 2360[6].

$C_{18}H_{25}BrO_5$ Propionic acid, *β*-(5-bromo-2,4-di-methoxybenzoyl)-*α*,*α*-diethoxy-, Et ester, 2154[9].

$C_{18}H_{25}NO$ *p*-Phenetidine, *N*-2-camphanylidene-, and salts, 408[6].

$C_{18}H_{25}NO_3$ Δ^1-3-Pentenone, 1-(3,4-dimethoxy-phenyl)-5-(1-piperidyl)-, -*HCl*, 963[9].

$C_{18}H_{25}NO_4$ Nipecotic acid, 1-(*γ*-hydroxypropyl)-, Et ester, benzoate, -*HCl*, 31[6].

$C_{18}H_{25}N_3O_2$ Borneol, *α*'-benzoyl-, semicarba-zone, 67[9].

$C_{18}H_{26}Br_2CoN_6O_4$ + 2H_2O, 1291[1].

$C_{18}H_{26}CaN_2O_8$ See *Ipral.*

$C_{18}H_{26}Cl_2N_4O_6$ Crotonic acid, *N*, *N'*-ethylene bis[*β*-amino-*α*-chloroacetyl-, di-Et ester, 221[2].

$C_{18}H_{26}CoN_{11}O_{11}$, 551[2].

$C_{18}H_{26}N_2$ Benzo[1,2-*γ*:4,5-*γ*']dipyrrole, 2,4,6,8 tetrahydro - 1,2,4,4,5,7,8,8 - octa-methyl-, 2561[9].